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*Phase 4: Project Analysis*

# Preliminary Project Report

## Total Maximum Daily Load
## for Pesticides in Watsonville Slough
## Santa Cruz County, California

**March 2005**

Regional Water Quality Control Board
Central Coast Region

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# 1. Project Definition

## 1.1. Introduction

The area covered in this Watsonville Slough Pesticide TMDL is the watershed upstream of the confluence of Watsonville Slough with the Pajaro River. Watsonville Slough is listed for impairment due to pesticides. The general location of the Watsonville Slough is shown in Figure 1-1.

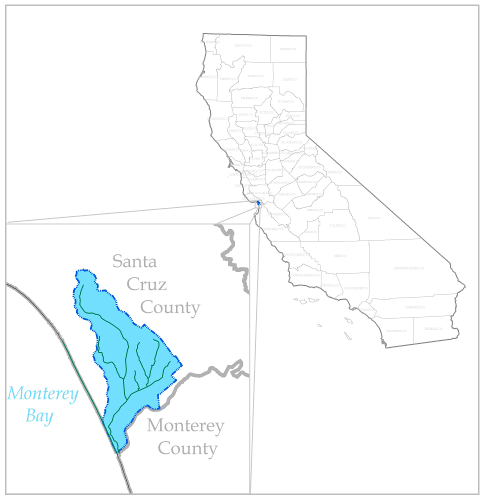


Figure 1-1 Location of Watsonville Slough Watershed

This document addresses both legacy pesticides (those pesticides no longer registered for use), priority organic compounds and two currently registered organphosphorus (OP) pesticides: chlorpyrifos and diazinon. Table 1-1 lists the waterbody/pollutant combinations that require TMDLs. There are 54 (56) waterbody/pollutant combinations identified in Table 1-1.

The waterbodies enumerated in Table 1-1 are listed for non-attainment of established water quality standards pertaining to toxicity and pesticides. Section 303(d) of the Clean Water Act requires the State to establish the Total Maximum Daily Load (TMDL) for those compounds shown in Table 1-1 at a level sufficient to attain the water quality standard for toxicity and pesticides. The State must also incorporate into the TMDL seasonal variations and a margin of safety that takes into account any lack of knowledge concerning the relationship between load limits and water quality.

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Table 1-1 Waterbody/Pollutant Combinations Requiring TMDLs

| No. | Waterbody Name | Current 303(d) List Pollutant(s) | Legacy Pesticides | | | | | | PCB, Total | Chlorpyrifos | Diazinon |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | p,p'-DDD | p,p'-DDE | p,p'-DDT | p,p'-DDT, Total | Dieldrin | Toxaphene | | | |
| 1 | Elkhorn Slough | Pesticides | | | | | X | | | | |
| 2 | Moro Cojo Slough | Pesticides | | | | | X | | | | |
| 3a | Moss Landing Harbor, North (Yacht Harbor)/Bennett Slough | Pesticides | | | | | X | | | | |
| 3b | Moss Landing Harbor, South | Pesticides | X | X | X | X | X | X | X | X | |
| 4 | Old Salinas River Estuary | Pesticides | | | | | X | X | | X | X |
| 5 | Tembladero Slough | Pesticides | X | X | X | X | X | X | X | X | X |
| 6a | Salinas Reclamation Canal, Lower | Pesticides, Priority Organics | X | X | | X | X | X | | X | X |
| 6b | Salinas Reclamation Canal, Upper/ Alisal Creek | Pesticides, Priority Organics | | | | X | X | X | X | | X |
| 7 | Espinosa Slough | Pesticides, Priority Organics | | | | | X | | | X | X |
| 8 | Salinas River Refuge Lagoon (South) | Pesticides | | | | | | | | | |
| 9 | Salinas River Lagoon (North) | Pesticides | | X | | X | X | | | X | X |
| 10 | Salinas River | Pesticides | | | | | | | | X | X |
| 11 | Blanco Drain | Pesticides | X | X | | X | X | X | X | X | X |
| 14 | Quail Creek | Not currently listed | | | | | | | | X | X |
| 15 | Chualar Creek | Not currently listed | | | | | | | | X | X |
| | Total waterbody/pollutant combinations | | 4 | 5 | 2 | 6 | 11 | 6 | 4 | 10 | 10 |

Some of the listed waterbodies are highly modified, and have been for almost 90 years. Much of the lower Salinas Valley was drained in 1910's and is currently managed for the production of row crops. Pumping occurs in certain areas in order to keep groundwater levels low enough to allow crops to be grown. Moss Landing Harbor was created in the late 1940's and required access to be established through a new channel that cut through the dunes at Elkhorn Slough. This channel allows year round tidal influence to an area that was, prior to the construction of the harbor, typically cut-off from the bay for at least part of the year. The channel has also caused head-cutting to occur in Elkhorn Slough side channels due to a lowering of the base level that occurred when the channel was established.

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### *TMDLs and a Stream's Assimilative Capacity for Sediment*

Sedimentation effects derive from the supply, transport, and distribution of sediment within a stream system. The supply can be traced to the various erosional processes that contribute sediment, including: landsliding, slumping, rilling, debris flows and bank failures. The quantity, timing and grain size of sediment delivered to the stream channel varies among these processes, as does their ultimate effect on fish habitat. These processes also have their genesis in both human (anthropogenic) and natural disturbances (SH&G, 2003, p. 4).

Once sediment is supplied to the stream, its transport and distribution are a function of channel geometry and hydraulic power. Human-induced changes to stream valleys, including the removal of trees or the construction of roads, can have a significant impact on channel function, especially when these changes occur within the inner gorge of the stream valley. Virtually any manipulation of the channel or of its stream flow that reduces hydraulic complexity will affect sediment distribution by limiting the sorting of fine sediment from coarser sediment. This in turn can eliminate or limit the creation of substrate features important to fish, such as pools, riffles and spawning gravels. Narrowing of the active channel by encroachment of land uses results in downcutting of the channel (incising), accelerated stream bank erosion, and entrainment of floodplain sediments that end up being deposited in the lower reaches of the watershed where the hydraulic forces (lessened by lower gradients) are insufficient to transport delivered sediment (Ibid.).

So, while the effects of sedimentation on beneficial uses are a function of the supply, or load, of sediment delivered to the stream, these effects also derive from factors controlling the transport and distribution of that sediment after its delivery. These factors combine to determine the stream's assimilative capacity for sediment. The Total Maximum Daily Load—more conveniently expressed as a maximum annual load—is that amount of sediment that can be delivered to the stream without exceeding its assimilative capacity. This document estimates the annual load that we would expect to be within Aptos and Valencia Creeks' current assimilative capacities. However, factors other than sediment supply (i.e., those controlling transport and distribution) will change over time, affecting these assimilative capacities. Management activities directed at these factors may result in increased assimilative capacity for sediment and should be pursued in concert with activities directed at reducing sediment supply.

## 1.2. Listing Basis

The listing rationale for the legacy pesticides was reviewed and a new rationale was developed as part of this TMDL effort. The "Lower Salinas Valley/Elkhorn Slough Area Legacy Pesticde/Priority Organics Decision Document" (CCRWCB, 2004) includes the methodology used and the conclusions reached as part of the review.

For chlorpyrifos and diazinon Hunt (2002) identified these pesticides as the cause of toxicity to benthic macroinvertebrates in some of the listed waterbodies. A subsequent study (CCoWS, 2004) was commissioned to investigate the sources and extent of the chlorpyrifos and diazinon impacts to water quality.

The results of the above legacy pesticide/priority organics review and the chlorpyrifos/diazinon study are reflected in Table 1-1.

## 1.3. Water Quality Objectives

The Central Coast Region's Water Quality Control Plan (Basin Plan) contains specific water quality objectives that apply to all inland surface waters, enclosed bays and estuaries and apply wholly, or in part, to pesticides/priority organics (CCRWQCB, 1994, pg. III-3). These include:

*Toxicity*

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*All waters shall be maintained free of toxic substances in concentrations which are toxic to, or which produce detrimental physiological responses in, human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, toxicity bioassays of appropriate duration, or other appropriate methods as specified by the Regional Board.*

*Survival of aquatic life in surface waters subjected to a waste discharge or other controllable water quality conditions, shall not be less than that for the same water body in areas unaffected by the waste discharge or, when necessary, for other control water that is consistent with the requirements for "experimental water" as described in* Standard Methods for the Examination of Water and Wastewater, *latest edition. As a minimum, compliance with this objective shall be evaluated with a 96-hour bioassay.*

*In addition, effluent limits based upon acute bioassays of effluents will be prescribed where appropriate, additional numerical receiving water objectives for specific toxicants will be established as sufficient data become available, and source control of toxic substances is encouraged.*

*The discharge of wastes shall not cause concentrations of unionized ammonia ($NH_3$) to exceed 0.025 mg/l (as N) in receiving waters.*

*Pesticides*

*No individual pesticide or combination of pesticides shall reach concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life.*

*For waters where existing concentrations are presently nondetectable or where beneficial uses would be impaired by concentrations in excess of nondetectable levels, total identifiable chlorinated hydrocarbon pesticides shall not be present at concentrations detectable within the accuracy of analytical methods prescribed in* Standard Methods for the Examination of Water and Wastewater, *latest edition, or other equivalent methods approved by the Executive Officer.*

*Other Organics*
*Waters shall not contain organic substances in concentrations greater than the following:*

| | |
|---|---|
| Methylene Blue *Activated Substances* | *0.2 mg/l* |
| *Phenols* | *0.1 mg/l* |
| ***PCB's*** | ***0.3 µg/l*** |
| *Phthalate Esters* | *0.002 µg/l* |

(Please note that the concentration for PCB's has been superseded by the California Toxics Rule which has a water column criteria for human health for consumption of water and organisms of 0.00017 ppb (µg/L) (qqqreference)).

Specific water quality objectives for organic chemicals apply to the Municipal and Domestic Supply (MUN) beneficial use as follows:

*Organic Chemicals*

*All inland surface waters, enclosed bays, and estuaries shall not contain concentrations of organic chemicals in excess of the limiting concentrations set forth in California Code of Regulations, Title 22, Chapter 15, Article 5.5, Section 64444.5, Table 5 and listed in Table 3-1.* The reference to the California Code of Regulations and the

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values in Table 3-1 are outdated. The current (as of 09/14/2004) reference should read: California Code of Regulations, Title 22, Division 4, Chapter 15, Article 5.5, Section 64444, Table 64444-A.

The reference to Title 22 contains Maximum Contaminant Levels (MCLs) for water supplied to the public. The MCLs for the chemicals of concern in the Lower Salinas Valley/Elkhorn Slough Watershed are higher than the corresponding criteria in the protection of Human Health for the consumption of water and organisms in the California Toxics Rule, therefore the CTR criteria are the controlling values (see Table 1-2). The following chemicals have CTR criteria but do not have corresponding MCLs: p,p'-DDD, p,p'-DDE, p,p'-DDT, and dieldrin. Chlorpyrifos and diazinon do not have CTR criteria or MCLs.

Table 1-2 Comparison of CTR Criteria and MCLs

| Compound | CTR Criteria (ppb) | MCL (ppb) |
|---|---|---|
| Toxaphene | 0.00073 | 3 |
| PCBs | 0.00017 | 0.5 |

## 1.4. Beneficial Uses

The designated beneficial uses identified in the Basin Plan for the listed waterbodies, are shown in Table 1-3 and Table 1-4. There are two separate Beneficial Use tables because the Basin Plan has one table for inland surface waters and one for coastal waters. Explanations of the beneficial use designations follow the tables.

Table 1-3 Basin-Plan designated Beneficial Uses for Inland Waters

| Waterbody Names | MUN | AGR | PROC | IND | GWR | REC1 | REC2 | WILD | COLD | WARM | MIGR | SPWN | BIOL | RARE | EST | FRESH | COMM | SHELL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Moro Cojo Slough | | | | | X | X | X | X | X | X | | X | X | X | X | | X | X |
| Old Salinas River Estuary | | | | | | X | X | X | X | X | X | X | X | X | X | | X | X |
| Tembldero Slough | | | | | | X | X | X | | X | | X | | X | X | | X | X |
| Espinosa Lake | | | | | | X | X | X | | X | | | | | | | X | |
| Espinosa Slough | | | | | | X | X | X | | X | | | | | | | X | |
| Salinas Reclamation Canal | | | | | | X | X | X | | X | | | | | | | X | |
| Alisal Creek | X | X | | | X | X | X | X | X | X | | X | | | | | X | |
| Blanco Drain | | | | | | X | X | X | | X | | | | | | | X | |
| Salinas River Refuge Lagoon (South) | | | | | | X | X | X | X | X | X | | X | X | | | X | X |
| Salinas River Lagoon (North) | | | | | | X | X | X | X | X | X | X | X | X | X | | X | X |
| Salinas River, dnstr of Spreckels Gage | X | X | | | | | X | X | X | X | X | | | | | X | X | |
| Salinas River, Spreckels Gage-Chualar | X | X | X | X | X | X | X | X | X | X | X | | | | | | X | |
| Salinas Riv, Chualar-Nacimiento Riv | X | X | X | X | X | X | X | X | X | X | X | X | | X | | | X | |

Note: Beneficial uses are regarded as existing whether the water body is perennial or ephemeral, or the flow is intermittent or continuous.

Table 1-4 Existing and Anticipated Uses of Elkhorn Slough and Moss Landing Harbor (Coastal Waters)

| Coastal Water | REC-1 | REC-2 | IND | NAV | MAR | SHELL | COMM | RARE | WILD |
|---|---|---|---|---|---|---|---|---|---|
| Elkhorn Slough[a] | E | E | | | E | E | E | E | E |
| Moss Landing Harbor | E | E | E | E | E | E[c] | E | E | E |

[a] Elkhorn Slough has been designated an ecological reserve by the California Department of Fish and Game, and recognized as a National Estuary Sanctuary by the Federal Government.

[c] Clamming is an existing beneficial use in the North Harbor and on the south side of the entrance channel to Elkhorn Slough (north of the Pacific Gas and Electric Cooling Water Intake). Presently, no shellfishing use occurs south of the Pacific Gas and Electric Intake.

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NOTE: E = Existing beneficial water use.

## *Beneficial Use Explanations:*

Municipal and Domestic Supply (MUN) - Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply. According to State Board Resolution No. 88-63, "Sources of Drinking Water Policy" all surface waters are considered suitable, or potentially suitable, for municipal or domestic water supply except where:

a. TDS exceeds 3000 mg/l (5000 uS/cm electrical conductivity);

b. Contamination exists, that cannot reasonably be treated for domestic use;

c. The source is not sufficient to supply an average sustained yield of 200 gallons per day;

d. The water is in collection or treatment systems of municipal or industrial wastewaters, process waters, mining wastewaters, or storm water runoff; and

e. The water is in systems for conveying or holding agricultural drainage waters.

Agricultural Supply (AGR) - Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

Industrial Process Supply (PROC) - Uses of water for industrial activities that depend primarily on water quality (i.e., waters used for manufacturing, food processing, etc.).

Industrial Service Supply (IND) - Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.

Ground Water Recharge (GWR) - Uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers. Ground water recharge includes recharge of surface water underflow.

Freshwater Replenishment (FRESH) - Uses of water for natural or artificial maintenance of surface water quantity or quality (e.g., salinity) which includes a water body that supplies water to a different type of water body, such as, streams that supply reservoirs and lakes, or estuaries; or reservoirs and lakes that supply streams. This includes only immediate upstream water bodies and not their tributaries.

Navigation (NAV) - Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels. This Board interprets NAV as, "Any stream, lake, arm of the sea, or other natural body of water that is actually navigable and that, by itself, or by its connections with other waters, for a period long enough to be of commercial value, is of sufficient capacity to float watercraft for the purposes of commerce, trade, transportation, and including pleasure; or any waters that have been declared navigable by the Congress of the United States" and/or the California State Lands Commission.

Water Contact Recreation (REC-1) - Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.

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Non-Contact Water Recreation (REC-2) - Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Commercial and Sport Fishing (COMM) - Uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

Warm Fresh Water Habitat (WARM) - Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Cold Fresh Water Habitat (COLD) - Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.

Estuarine Habitat (EST) - Uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds). An estuary is generally described as a semi-enclosed body of water having a free connection with the open sea, at least part of the year and within which the seawater is diluted at least seasonally with fresh water drained from the land. Included are water bodies which would naturally fit the definition if not controlled by tidegates or other such devices.

Marine Habitat (MAR) - Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).

Wildlife Habitat (WILD) - Uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Preservation of Biological Habitats of Special Significance (BIOL) - Uses of water that support designated areas or habitats, such as established refuges, parks, sanctuaries, ecological reserves, or Areas of Special Biological Significance (ASBS), where the preservation or enhancement of natural resources requires special protection.

Rare, Threatened, or Endangered Species (RARE) - Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened, or endangered.

Migration of Aquatic Organisms (MIGR) - Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.

Spawning, Reproduction, and/or Early Development (SPWN) - Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Shellfish Harvesting (SHELL) - Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sport purposes. This includes waters that have in the past, or may in the future, contain significant shellfisheries.

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## 1.5. Potential Effects of Compounds on Beneficial Uses

The listed waterbodies addressed in this document exceed narrative water quality objectives for toxicity and pesticides because beneficial uses have been, or may be, adversely impacted by various compounds that cause toxicity to aquatic life or affect other beneficial uses in some way.

### *Municipal and Domestic Supply (MUN)*

The Basin Plan states specifically for Municipal and Domestic Supply that "all waters shall not contain concentration of organic chemicals in excess of the limiting concentrations set forth in California Code of Regulations, Title 22…" This is a reference to the Maximum Contaminant Levels (MCLs) allowed in water supplied to the public. .Municipal supply can be affected by compounds in excess of the California Toxics Rule criteria for Human Health risk for consumption of water and organisms.

No data indicate exceedance of these criteria for any compounds.

### *Industrial Process Supply (PROC) and Industrial Service Supply (IND)*

Although there are no specific water quality objectives set for these beneficial uses, there may be processes that require water free of pesticides/priority organic compounds that could be affected by elevated concentrations of these compounds. Staff is not aware of any current uses that require water to meet specific contaminant levels.

No data indicate that these Beneficial Uses have been affected by elevated contaminant levels.

### *Ground Water Recharge (GWR)*

Although there are no specific water quality objectives associated with this beneficial use, the Basin Plan states specifically for Municipal and Domestic Supply that "all ground waters shall not contain concentration of organic chemicals in excess of the limiting concentrations set forth in California Code of Regulations, Title 22…" This is a reference to the Maximum Contaminant Levels (MCLs) allowed in water supplied to the public. Therefore, it is asserted that wherever the GWR beneficial use is assigned the MCLs shall not be exceeded. As with the MUN beneficial use, the MCLs for the chemicals of concern in the Lower Salinas Valley/Elkhorn Slough Watershed are higher than the corresponding criteria in the California Toxics Rule, therefore the CTR criteria are the controlling values (see section 1.3 Water Quality Objectives).

No data indicate exceedance of these criteria for any compounds.

### *Freshwater Replenishment (FRESH)*

There is only one waterbody where this beneficial use applies, that is the Salinas River, downstream of the USGS Gage at Spreckels. This is the section of the river just upstream of the Salinas River Lagoon/North. Elevated levels of contaminants in this section could affect aquatic life beneficial uses in the lagoon, thereby impacting the freshwater replenishment function of this section of river.

Data implies that Blanco Drain may be the source of contaminants that affect the Salinas River Lagoon, North. The Salinas River is a conveyance between Blanco Drain and the lagoon.

### *Agriculture (AGR)*

There are no specific water quality criteria for the compounds of concern for this beneifical use.

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## Navigation (NAV)

The navigation beneficial use is assigned to Moss Landing Harbor. Dredging activities that are performed to maintain the navigability of the harbor have been impacted by excessive contaminant levels in the sediment. When contaminant levels exceed certain thresholds the dredge spoils can not be disposed of offshore and must be stored, dried and trucked to a disposal facility. This has caused costs to be incurred above and beyond the normal operating costs.

## Water Contact Recreation (REC-1)

Fishing can be affected by elevated contaminant levels in fish/shellfish tissue. Elevated contaminant levels can render the fish inedible or reduce the amount of fish/shellfish that can eaten safely.

NTR:It is unclear at this time if direct contact with, or minor ingestion of, contaminated water is a realistic concern.

## Non-Contact Water Recreation (REC-2)

Marine life study may be affected by elevated contaminant levels as it may negatively affect the structure of the biological community.

Data indicate that aquatic biological communities may have been affected by elevated pollutant levels.

## Commercial and Sport Fishing (COMM) and Shellfish Harvesting (SHELL)

The COMM and SHELL beneficial uses may be directly affected by elevated contaminant levels in fish and shellfish tissue. The elevated contaminant levels may affect the ability to sell catches of commercial fishermen and may require limiting the amount of fish or shellfish eaten or may render the fish or shellfish inedible.

Data indicate that elevated contaminant levels in fish/shellfish tissue have found in most of the listed waterbodies.

## Warm Fresh Water Habitat (Warm), Cold Freshwater Habitat (COLD), Estuarine Habitat (EST) and Marine Habitat (MAR)

Community structure within the various habitats may be affected by toxicity expressed as mortality, reduced reproductive capacity, behavioral changes and impaired health of organisms that reside in the various habitats.

Data indicate that aquatic biological communities may have been affected by elevated pollutant levels.

## Wildlife Habitat (WILD)

Terrestrial wildlife that consume aquatic species may experience bioaccumulation of the chlorinated organic chemicals (DDT, Dieldrin, PCBs and Toxaphene) that may affect their health and ability to reproduce.

Elevated levels of DDT, toxaphene and PCBs were found in Caspian Terns in the vicinity of Elkhorn Slough after the floods of 1995, relative to 1994 (Elkhorn Slough Foundation, Website-1). The terns experienced an increase in chick mortality in 1995 that may have been related to the elevated contaminant levels found in their bodies.

## Rare, Threatened, or Endangered Species (RARE)

Rare, threatened or endangered species may experience toxicity if they ingest contaminated water or consume contaminated organisms. Toxicity may expressed as mortality, reduced reproductive capacity, behavioral changes and impaired health of organisms that reside in the various habitats.

There is no data that indicates that rare, threatened or endangered species have been affected by elevated contaminant levels.

### *Migration of Aquatic Organisms (MIGR)*

Scholz, et al (2000) have shown chinook salmon homing behavior to be affected by diazinon levels of 10 µg/L (ppb).

Data from the CCoWS study indicate that only one waterbody exceeded 10 µg/L, and it is the non-salmonid stream that feeds Espinosa Lake that was sampled at Rodgers Road.

### *Spawning, Reproduction and /or Early Development (SPWN)*

Spawning and development of a number of species may be negatively affected by the presence of pesticides/priority organic compounds in bottom sediments, porewater and water column.

The "Chemical and Biological Measures of Sediment Quality in the Central Coast Region" (BPTCP, 1998) has found bottom sediments, porewater and water column to affect growth and survival, embryo-larval development and fertilization of a number of species.

A direct link between these types of toxicity and pesticides/priority organics was not established in the report.

### *Preservation of Biological Habitats of Special Significance (BIOL)*

The Elkhorn Slough National Estuarine Research Reserve is located on Elkhorn Slough and the Salinas National Wildlife Refuge is located on the Salinas River Lagoon/North. Both waterbodies are listed for pesticides that have been shown to affect the structure of the aquatic biological community.

## 1.6. Statement of Impairment

The narrative water quality objectives for toxicity and pesticides have been exceeded for the waterbody/pollutant combinations in Table 1-1. As discussed in the previous section, multiple beneficial uses are, or could be, affected by these exceedances.

There are no water column data that exceed any of the identified water quality objectives for specific compounds for Municipal and Domestic Supply (MUN).

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## 2. WATERSHED DESCRIPTION

For the purposes of this report the Lower Salinas Valley/Elkhorn Slough Area has been broken into two major subwatersheds. There is the Elkhorn Slough/Tembladero Slough/Old Salinas River Estuary/Moro Cojo Slough/Moss Landing Harbor subwatershed and the Blanco Drain/Salinas River/Salinas River Lagoon/North subwatershed. These two subwatersheds are essentially separate watersheds with a small connection between the Salinas River Lagoon/North and the Old Salinas River Estuary through a slide gate at the northwest end of the Salinas River Lagoon/North.

For the legacy pesticides, the Salinas River subwatershed has been limited to the valley floor that borders the river north of Gonzales (this subwatershed is defined as part of the CalWater, ver. 2.2 watersheds). This was done because monitoring data indicate that there is no significant source of legacy pesticides/priority organic compounds in the Salinas River above the point where Blanco Drain enters the river.

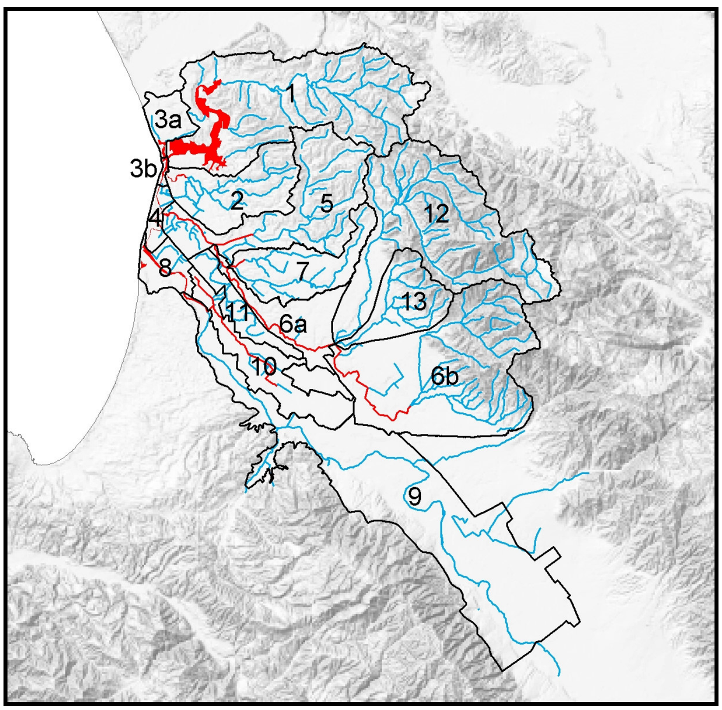


Figure 2-1 Legacy Pesticide/Priority Organic  Watersheds (Waterbodies impaired by legacy pesticides/priority organics shown in red)

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Table 2-1 Legacy Pesticde/Priority Organic Watersheds

| Watershed Number | Watershed | Area (Acres) |
|---|---|---|
| 1 | Elkhorn Slough | 30,329 |
| 2 | Moro Cojo Slough | 9,731 |
| 3a | Moss Landing Harbor, North/Bennett Slough | 2,798 |
| 3b | Moss Landing Harbor, South | 273 |
| 4 | Old Salinas River Estuary | 1,463 |
| 5 | Tembladero Slough | 16,737 |
| 6a | Salinas Reclamation Canal, Lower | 6,562 |
| 6b | Salinas Reclamation Canal, Upper/Alisal Creek | 29,600 |
| 7 | Espinosa Slough | 8,645 |
| 8 | Salinas River Lagoon, North | 3,057 |
| 9 | Salinas River | 41,708 |
| 10 | Blanco Drain | 8,299 |
| 11 | Alisal Slough Remnant (Rec Canal) | 3,703 |
| 12 | Gabilan Creek | 27,713 |
| 13 | Natividad Creek | 7,404 |
| | Total Acreage | 198,022 |

Figure 2-1 displays the separate watersheds that were included in the legacy pesticide analysis and Table 2-1 ties the numeric code in the figure to the watershed name and size.

For the currently registered organophosphorus (OP) pesticides (chlorpyrifos & diazinon) the following watersheds were not included in the analysis the Elkhorn Slough (WS#1), Moro Cojo Slough (WS#2) and Moss Landing Harbor, North/Bennett Slough (WS#3a) because there is no evidence that the waterbodies within these watersheds are impaired by chlorpyrifos or diazinon and they do not appear to be sources of chlorpyrifos or diazinon based on the California Department of Pesticide Regulation Pesticide Use Report. The Quail Creek watershed (WS#15) has been added to the analysis because there is specific information that the Salinas River below Quail Creek, as well as Quail Creek, experience toxicity due to chlorpyrifos and diazinon (Hunt, 2002). The same report (Hunt, 2002) indicates that there is no toxicity immediately upstream of Quail Creek, so the Salinas River Watershed was limited to the valley floor below Gonzalez as it was for the legacy pesticide/priority organic analysis. Figure 2-2 displays the separate watersheds that were included in the legacy pesticide analysis and Table 2-2 ties the numeric code in the figure to the watershed name and size.

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Table 2-2 Organophosporus Pesticide Watersheds

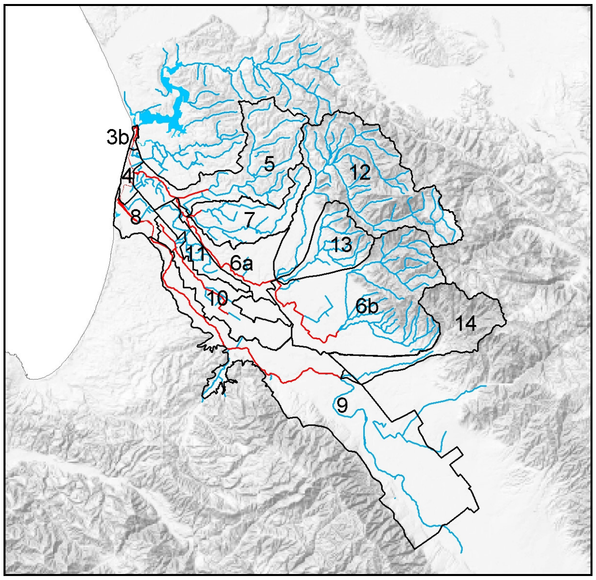


Figure 2-2 Organophosporus Pesticide Watersheds
(Waterbodies impaired by OP Pesticides shown in red)qqq add chualar

| Watershed Number | Watershed | Area (Acres) |
|---|---|---|
| 3b | Moss Landing Harbor, South | 273 |
| 4 | Old Salinas River Estuary | 1,463 |
| 5 | Tembladero Slough | 16,737 |
| 6a | Salinas Reclamation Canal, Lower | 6,562 |
| 6b | Salinas Reclamation Canal, Upper/Alisal Creek | 29,600 |
| 7 | Espinosa Slough | 8,645 |
| 8 | Salinas River Lagoon, North | 3,057 |
| 9 | Salinas River | 41,708 |
| 10 | Blanco Drain | 8,299 |
| 11 | Alisal Slough Remnant (Rec Canal) | 3,703 |
| 12 | Gabilan Creek | 27,713 |
| 13 | Natividad Creek | 7,404 |
| 14 | Quail Creek | 11,237 |
| 15 | Chualar Creek | qqq |
| | Total Acreage | 166,401 |

## 2.1. Land Use/Land Cover (LULC)

The acreage of different land uses within the various watersheds has been estimated using the National Land Cover Data (NLCD) provided by the Multi-Resolution Land Characteristics Consortium (MRLC, 1992). The MRLC membership includes the U.S. Geological Survey (USGS), Environmental Protection Agency (EPA), National Oceanic and Atmospheric Administration (NOAA) and the U.S. Forest Service (USFS) the National Atmospheric and Space Administration (NASA) and the Bureau of Land Management (BLM).

The NLCD was derived from images acquired by Landsat's Thematic Mapper (TM) sensor, as well as a number of ancillary data sources. Land use categories in Figure 2-3 and Table 2-3 are aggregate categories based on the original level II classification scheme for the NLCD.

In Figure 2-3 it can be seen that the agricultural lands are concentrated in the valley bottom and in flat land near the bay. Salinas is the large developed area in the center of the figure. There is scattered development northeast of Castroville. Grasslands, shrublands and forested lands are found in the hills and mountains on the eastern side of the valley floor.

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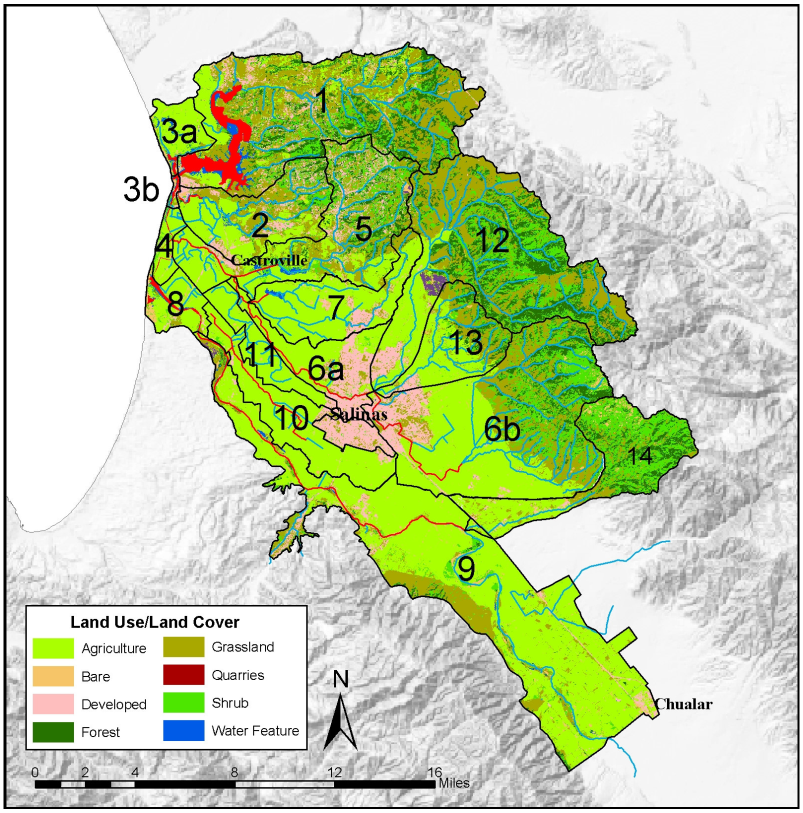


Figure 2-3 Land Use/Land Cover (Listed waterbodies shown in red)

Table 2-3 Land Use/Land Cover Acreage from MRLC (1992)

| | Watershed | Total Watershed Acreage | Agriculture | Bare | Developed | Forest | Grassland | Quarries | Shrub | Water Feature |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Elkhorn Slough | 30,330 | 3,978 | 414 | 2,245 | 5,627 | 12,040 | | 4,040 | 1,986 |
| 2 | Moro Cojo Slough | 9,732 | 3,305 | 175 | 1,418 | 627 | 2,804 | | 1,230 | 172 |
| 3a | Moss Landing Harbor, North/Bennett Slough | 2,796 | 2,081 | 169 | 50 | 23 | 96 | | 212 | 166 |
| 3b | Moss Landing Harbor, South | 273 | 16 | 41 | 70 | 2 | 34 | | 44 | 67 |
| 4 | Old Salinas River Estuary | 1,462 | 1,195 | 40 | 62 | 1 | 10 | | 145 | 10 |
| 5 | Tembladero Slough | 16,737 | 5,325 | 216 | 2,040 | 1,985 | 4,039 | 26 | 2,907 | 199 |
| 6a | Salinas Reclamation Canal, Lower | 6,563 | 3,669 | 110 | 2,269 | 1 | 374 | | 139 | |
| 6b | Salinas Reclamation Canal, Upper/Alisal Creek | 29,601 | 11,637 | 479 | 2,339 | 2,868 | 6,552 | | 5,719 | 8 |
| 7 | Espinosa Slough | 8,646 | 7,007 | 133 | 674 | 72 | 598 | | 80 | 83 |
| 8 | Salinas River Lagoon, North | 3,058 | 2,160 | 306 | 105 | 13 | 127 | | 200 | 147 |
| 9 | Salinas River | 41,709 | 30,041 | 1,172 | 2,710 | 548 | 5,413 | 71 | 1,609 | 145 |
| 10 | Blanco Drain | 8,300 | 7,702 | 87 | 393 | 1 | 66 | | 51 | |

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| | Watershed | Total Watershed Acreage | Agriculture | Bare | Developed | Forest | Grassland | Quarries | Shrub | Water Feature |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 | Alisal Slough Remnant (Rec Canal) | 3,703 | 3,514 | 51 | 127 | | 8 | | 4 | |
| 12 | Gabilan Creek | 27,713 | 3,559 | 140 | 781 | 7,167 | 9,657 | 321 | 6,083 | 5 |
| 13 | Natividad Creek | 7,405 | 3,583 | 63 | 281 | 840 | 1,917 | 19 | 685 | 17 |

Table 2-4 Land Use/Land Cover % of Watershed from MRLC (1992)

| | Watershed | Total Watershed Acreage | % Agriculture | % Bare | % Developed | % Forest | % Grassland | % Quarries | % Shrub | % Water Feature |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Elkhorn Slough | 30,330 | 13.1% | 1.4% | 7.4% | 18.6% | 39.7% | | 13.3% | 6.5% |
| 2 | Moro Cojo Slough | 9,732 | 34.0% | 1.8% | 14.6% | 6.4% | 28.8% | | 12.6% | 1.8% |
| 3a | Moss Landing Harbor, North/Bennett Slough | 2,796 | 74.4% | 6.0% | 1.8% | 0.8% | 3.4% | | 7.6% | 5.9% |
| 3b | Moss Landing Harbor, South | 273 | 5.7% | 14.9% | 25.7% | 0.6% | 12.5% | | 16.1% | 24.6% |
| 4 | Old Salinas River Estuary | 1,462 | 81.7% | 2.7% | 4.3% | 0.0% | 0.7% | | 9.9% | 0.7% |
| 5 | Tembladero Slough | 16,737 | 31.8% | 1.3% | 12.2% | 11.9% | 24.1% | 0.2% | 17.4% | 1.2% |
| 6a | Salinas Reclamation Canal, Lower | 6,563 | 55.9% | 1.7% | 34.6% | 0.0% | 5.7% | | 2.1% | |
| 6b | Salinas Reclamation Canal, Upper/Alisal Creek | 29,601 | 39.3% | 1.6% | 7.9% | 9.7% | 22.1% | | 19.3% | |
| 7 | Espinosa Slough | 8,646 | 81.0% | 1.5% | 7.8% | 0.8% | 6.9% | | 0.9% | 1.0% |
| 8 | Salinas River Lagoon, North | 3,058 | 70.6% | 10.0% | 3.4% | 0.4% | 4.1% | | 6.5% | 4.8% |
| 9 | Salinas River | 41,709 | 72.0% | 2.8% | 6.5% | 1.3% | 13.0% | 0.2% | 3.9% | 0.3% |
| 10 | Blanco Drain | 8,300 | 92.8% | 1.0% | 4.7% | 0.0% | 0.8% | | 0.6% | |
| 11 | Alisal Slough Remnant (Rec Canal) | 3,703 | 94.9% | 1.4% | 3.4% | 0.0% | 0.2% | | 0.1% | |
| 12 | Gabilan Creek | 27,713 | 12.8% | 0.5% | 2.8% | 25.9% | 34.8% | 1.2% | 21.9% | |
| 13 | Natividad Creek | 7,405 | 48.4% | 0.8% | 3.8% | 11.3% | 25.9% | 0.3% | 9.2% | 0.2% |

## 2.2. Topography

The area of interest for this report generally encompasses portions of the Gabilan Range to the east, the Salinas Valley floor north of Gonzalez and the associated coastal plain as well as the rolling sand hills between the north end of the Gabilan Range and Elkhorn Slough. Johnson Peak in the Gabilan Range east of Chualar reaches an elevation of 3,465 feet.

## 2.3. Climate

“Monterey County is favored with a generally mild climate. Temperatures near the coast are uniform throughout the year, but the range widens as distance from the water increases. At inland locations, summers are warm to hot and winters have minimum readings below freezing.

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"The growing season is as short as 150 days in some mountain areas, but ranges from 200 days to more than 350 days in most areas where cultivated crops area grown.

"Precipitation is concentrated in winter. Totals range from about 10 inches in drier locations to near or slightly above 80 inches in the coastal mountains. Snowfall in the county is generally insignificant, although a limited amount is received each winter at the higher elevations.

"Abundant sunshine is characteristic of the inland area, but coastal areas and the coastal end of the Salinas Valley are subject to considerable cloudiness in summer. Much fo this cloudiness, however, occurs during the night and morning hours.

"Winds are generally less than 10 to 15 miles per hour, though stronger winds are common to some areas along the coast. Winter storms produce some damaging winds, particularly in open areas and at higher elevations…

"The average annual temperature is about 55° F along the coast and in the mountains along the eastern boundary. Annual temperatures of about 60° F are characteristic of the interior valley" SCS(1978).

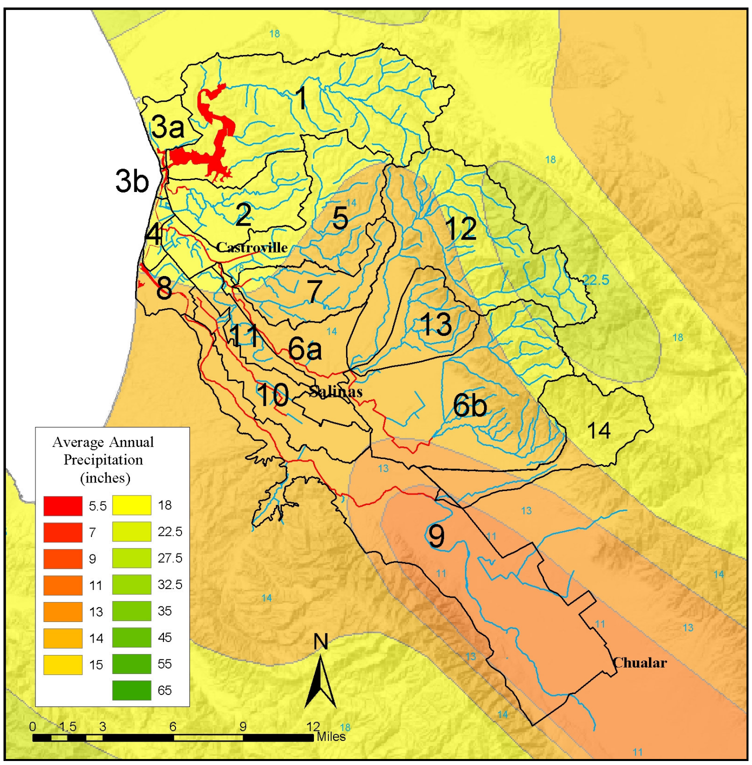

Figure 2-4 Average Annual Precipitation

Figure 2-4 Displays average annual precipitation for the lower Salinas Valley/Elkhorn Slough area. As can be seen in the figure, the valley floor receives 11 inches/year while the Gabilan Range receives twice that amount in the headwaters of Gabilan and Alisal Creeks due to orographic affect.

## 2.4. Hydrology

Streams in the area may be perennial in the mountains, seasonal in the lowlands with agricultural return flows providing all, or the majority, of the flow in some streams during non-storm times. Some of the waterbodies are

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tidally influenced, especially those connected to the Elkhorn Slough. These waterbodies include Moss Landing Harbor, Moro Cojo Slough, the Old Salinas River Estuary and portions of Tembladero Slough.

The Salinas River Lagoon/North may receive salt water from Monterey Bay during winter storms that may overtop the sand bar between the lagoon and the bay. The sand bar is periodically mechanically breached during the winter by the Monterey County Water Resources Agency based on anticipated flood flows in the Salinas River. This breaching usually drains the lagoon to some extent while allowing salt water to flow in once the lagoon water level has stabilized.

The streams that have their headwaters in the Gabilan Range are typically flashy streams that may require multiple storms to replenish them before they become fully connected to the bay. The Salinas River typically requires multiple storms before reconnecting to the bay.

Figure 2-5, Figure 2-6 and Figure 2-7 display in a graphical format discharge data (USGS, Website) from USGS gage stations located on three waterbodies in the Lower Salinas Valley. Data displayed for each gage is from 10/1/1970 to 9/30/2003. The Salinas gage at Spreckels has a contributing watershed area of more than 4,000 sq mi. Discharge at this gage is also affected by releases at from Lake Nacimiento and Lake San Antonio that are used to replenish groundwater in the Salinas Valley. The Gabilan Creek gage has a contributing watershed of 36.7 sq mi that is mostly upland areas with some agriculture in the valley bottoms. The Salinas Reclamation Canal gage is located downstream of the City of Salinas and has a contributing watershed area of 53.2 sq mi. The Gabilan Creek watershed is part of the larger Salinas Reclamation Canal watershed.

The graphs (note the different scales for discharge) show the flashiness of the watersheds at all scales. Large runoff events are associated with storms that typically arrive during the late fall and winter seasons. The drought of the late 1980's and early 1990's is apparent in Figure 2-5 and Figure 2-7 (the Salinas Reclamation Canal gage was decommissioned for a number years during that time period). Long periods with no, to very low flow were recorded during the drought. Spatial variability can be seen by comparing the Salinas River and Gabilan Creek discharges during the 1995 flood and the 1998 flood. Peak flow for the Salinas River for the two floods occurred in 1995 while peak flow for the Gabilan Creek occurred during the 1998 flood. Due to the nature and size of the storms that hit the Central Coast of California and the size of the Salinas River watershed different areas experience different amounts and intensity of rainfall throughout the region.

The high variability in flow can make sizing sediment and run-off control structures a challenge. Most structures are sized for a certain storm return interval, such as 10-year storm. When storm events exceed the design storm for a structure, the structures may not function as designed.

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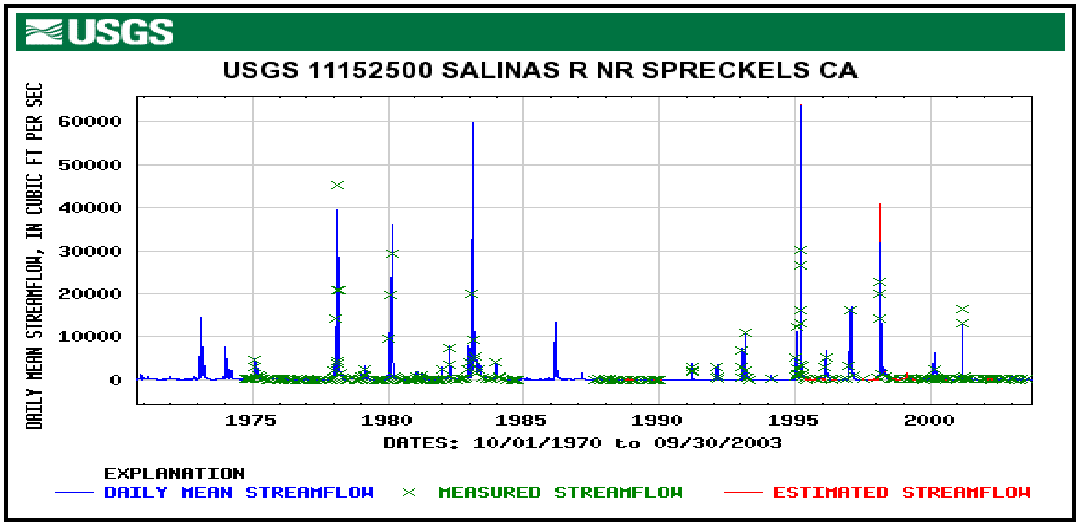


Figure 2-5 Salinas River at Spreckels, Daily Mean Discharge (ft3/s)

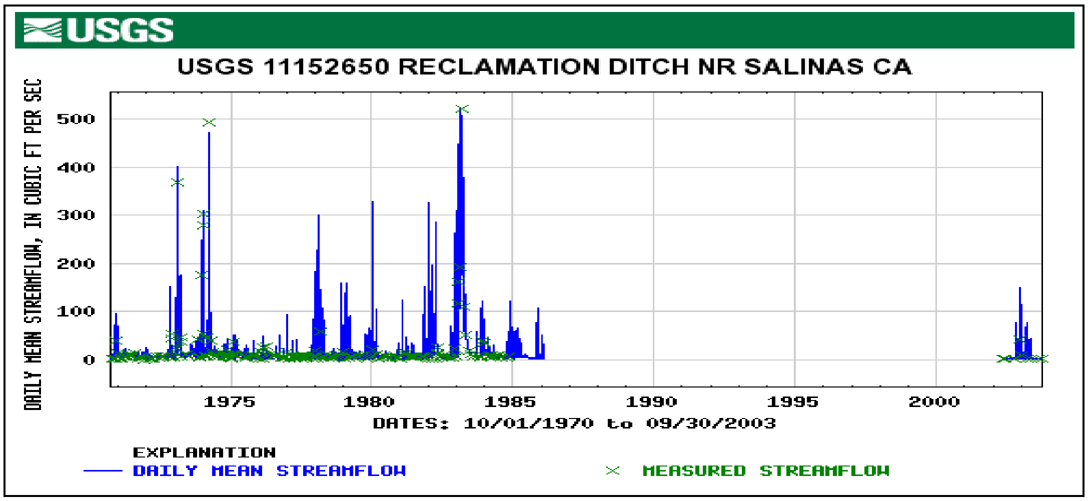


Figure 2-6 Salinas Reclamation Ditch, Downstream of City of Salinas, Daily Mean Discharge (ft3/s)

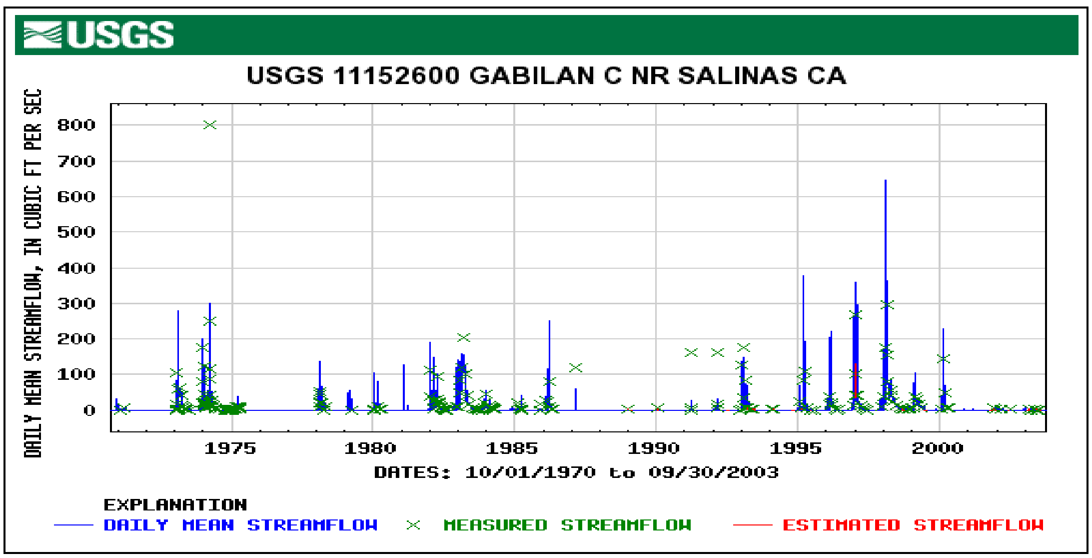


Figure 2-7 Gabilan Creek, Upstream of City of Salinas, Daily Mean Discharge (ft3/s)

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## 2.5. Pesticide Use in the Salinas Valley and Elkhorn Slough

Pesticide use the Salinas Valley and the Elkhorn Slough Watershed has been tracked by the Department of Pesticide Regulation since 1990. Annual amounts of chlorpyrifos and diazinon used in the Salinas Valley (Hydrologic Unit 309) are shown in Figure 2-8. Historic use of legacy pesticides cannot be estimated since there were no reporting requirements for pesticide application prior to 1990.

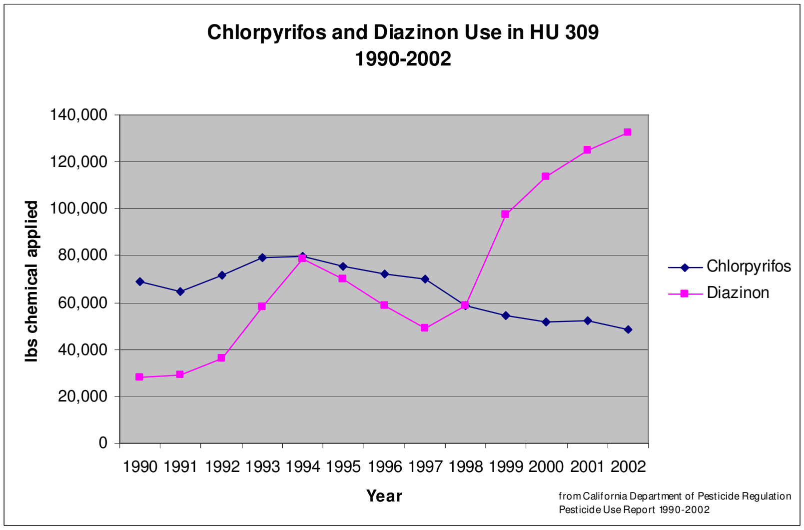


Figure 2-8 Annual Chlorpyrifos and Diazinon Use in HU 309

The following discussion of DDT, Dieldrin, PCBs and Toxaphene is taken from the Decision Document (CCRWQCB, 2004, pp. 42-43) for the legacy pesticides/priority organics.

Nationally, DDT was extensively used on crops after 1945 and was banned in the United States in 1972. DDT was used for mosquito abatement by Monterey County until 1957 when its use was discontinued for this purpose.

Dieldrin was used widely on crops between the 1950's and the 1970's. All uses of dieldrin were banned in 1974, except for termite control. Termite control was banned in 1987. The dieldrin that is detected today may be derived from aldrin, another pesticide that quickly breaks down to dieldrin in the environment.

Polychlorinated biphenyls (PCBs) are mixtures of up to 209 individual chlorinated compounds known as congeners. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor. PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977.

Toxaphene is an insecticide containing over 670 chemicals. Toxaphene was one of the most heavily used insecticides in the United States until 1982, when it was canceled for most uses; all uses were banned in 1990. One of its uses was to kill unwanted fish in lakes.

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# 3. Data Analysis

## 3.1. Introduction

There are three main documents that form the basis of the data analysis for this TMDL. The *Decision Document for Legacy Pesticides/Priority Organics* (CCRWQCB, 2004) is a synthesis of many studies and many sources of data associated with compounds that are no longer in use. It establishes which streams are impaired by which legacy pesticides/priority organics. *Monitoring Chlorpyrifos and Diazinon in Impaired Surface Waters of the Lower Salinas Region* (CCoWS, 2004) provides the data and analysis that forms the basis for most of the conclusions associated with the currently registered pesticides chlorpyrifos and diazinon. *Ambient Toxicity due to Chlorpyrifos and Diazinon in a Central California Coastal Watershed* (Hunt, 2002) informed the CCoWS work as well as supplements it by providing detailed monitoring and analysis of the impacts of chlorpyrifos and diazinon on the aquatic environment.

The California Department of Pesticide Regulation's Surface Water Database provided data in addition to the data provided by the CCoWS report and the Hunt report.

## 3.2. Findings

### *Legacy Pesticides/Priority Organics*

#### *Approach and Methods*

The analysis of the legacy pesticides/priority organics is detailed in the Decision Document for this TMDL (CCRWQCB, 2004). The results of that document are summarized here.

In order to analyze the existing data for the listed waterbodies, staff modified a weight-of-evidence approach that USEPA used in their analysis of San Diego Creek and Newport Bay (USEPA, 2002). The approach uses different criteria for determining if a TMDL is required for a specific waterbody/pollutant combination. Criteria are selected based on the amount and currency of available data. Since much of the existing data for these compounds is greater than 10 years, it was critical to use a method that would treat data according to its age. A number of criteria were developed for analyzing water column data, fish/shellfish tissue data and sediment data. Table 3-1 summarizes the categories and criteria used in weight-of-evidence approach. The table was taken from the Decision Document for this TMDL (CCRWQCB, 2004, p.12).

Table 3-1Two-tiered Approach to Assessment of Monitoring Data for Salinas River Valley/Elkhorn Slough Area Waterbodies

| | *Water Quality Category* | Sediment Quality Category | Tissue Results Category |
|---|---|---|---|
| Tier 1<br>Impairment to Aquatic Life or Probable Adverse Human Health effects | >10% and 2 or more samples [A] exceed CTR values within last 3 years<br>OR<br>Water TIEs clearly demonstrate toxicant (data ≤ 10 years old)<br>OR<br>1 sample > 20x CTR value (data ≤ 20 years old) | >25% and 3 or more samples [B] exceed *minimum* high SNIVs (data ≤ 10 years old)<br>OR<br>Sediment triad or TIE studies clearly demonstrate toxicant (data ≤ 10 years old)<br>OR<br>1 sample > 20x minimum high SQGs (data ≤ 20 years old) | posted consumption advisory within last 10 years<br>OR<br>>25% and 3 or more samples [B] above tissue screening values (data ≤ 10 years old)<br>OR<br>1 sample > 20x tissue screening value (data ≤ 20 years old) |

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| | *Water Quality Category* | Sediment Quality Category | Tissue Results Category |
|---|---|---|---|
| <u>Tier 2</u><br>Possible Effects to Aquatic Life or Human Health | Two or more samples [A] exceed applicable CTR values (data ≤ six years old)<br>OR<br>2 samples > 3x CTR value (data ≤ 20 years old) | >10% and 2 or more [A] samples above *maximum* of low SNIVs (data ≤ 10 years old)<br>OR<br>2 samples > 3x maximum of low SQGs (data ≤ 20 years old) | >10% and 2 or more [A] samples above fish/shellfish tissue screening values (data ≤ 10 years old)<br>OR<br>2 samples >3x tissue screening value (data ≤ 20 years old) |
| <u>Tier 2 Toxicity</u><br>Possible Effects to Aquatic Life | OR<br>Toxicity evident and associated water chemistry results exceed CTR values, but no TIEs (data ≤ 20 years old) | OR<br>Toxicity evident and associated sediment chemistry results exceed maximum of low SNIVs, but no TIEs (data ≤ 20 years old) | |
| <u>Comment</u><br>TMDL is triggered by one category in Tier 1 but needs two categories in Tier 2 | see CTR for full discussion of acute and chronic values | High SNIVs = minimum of PELs/ERMs/AETs;<br>Low SNIVs = maximum of ERLs/TELs | Use lowest value of EPA, OEHHA, USFDA. Use State of Maine if no other value. |

Acronyms explained in qqqCreateAppendix**Error! Reference source not found.**

[A] >10% <u>and</u> "two or more" from EPA 305(b) guidance (1997), section 3.2.4 on toxics in water samples.

[B] 25% from Consolidated Assessment and Listing Methodology guidance (EPA draft report 2001b).

The majority of the data that was analyzed came from one of four different programs:

1. Bay Protection and Toxic Clean-up Program – took effects-based measurements of impacts in California's enclosed bays and estuaries. The BPTCP monitoring program sampled nearly 1,100 stations throughout the state between 1992 and 1997.
2. Toxic Substances Monitoring Program – a program administered by California's Department of Fish and Game since 1976. The program analyzes fish and other aquatic organisms from selected sampling stations for the detection and evaluation of the occurrence of toxic substances in fresh and estuarine waters of the state.
3. State Mussel Watch Program – a program run by California's Department of Fish and Game since 1976. The program analyzes resident and transplanted mussels and clams for trace elements, pesticides and PCBs.
4. Central Coast Ambient Monitoring Program – a program run by the Central Coast Regional Board to monitor ambient water quality throughout the region. Water column, sediment and benthic macroinvertebrate data are collected on a five year rotation.

### *Findings*

The data from the above programs was analyzed using the weight-of-evidence approach. The results of that analysis are shown in

Table 3-2. Any waterbody/pollutant combination that has an "X" in its corresponding box requires a TMDL to be developed because there was an exceedance of the relevant criteria used in the weight-of-evidence approach.

Table 3-2 Legacy Pesticides/Priority Organics Waterbody/Pollutant Combinations that Require TMDLs

| No. | Waterbody Name | Current 303(d) List Pollutant(s) | Legacy Pesticides | B, To |
|---|---|---|---|---|

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| | | | p,p'-DDD | p,p'-DDE | p,p'-DDT | p,p'-DDT, Total | Dieldrin | Toxaphene | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Elkhorn Slough | Pesticides | | | | | X | | |
| 2 | Moro Cojo Slough | Pesticides | | | | | X | | |
| 3a | Moss Landing Harbor, North (Yacht Harbor)/Bennett Slough | Pesticides | | | | | X | | |
| 3b | Moss Landing Harbor, South | Pesticides | X | X | X | X | X | X | X |
| 4 | Old Salinas River Estuary | Pesticides | | | | | X | X | |
| 5 | Tembladero Slough | Pesticides | X | X | X | X | X | X | X |
| 6a | Salinas Reclamation Canal, Lower | Pesticides, Priority Organics | X | X | | X | X | X | |
| 6b | Salinas Reclamation Canal, Upper/ Alisal Creek | Pesticides, Priority Organics | | | | X | X | X | X |
| 7 | Espinosa Slough | Pesticides, Priority Organics | | | | | X | | |
| 8 | Salinas River Refuge Lagoon (South) | Pesticides | | | | | | | |
| 9 | Salinas River Lagoon (North) | Pesticides | | X | | X | X | | |
| 10 | Salinas River | Pesticides | | | | | | | |
| 11 | Blanco Drain | Pesticides | X | X | | X | X | X | X |
| | **Total waterbody/pollutant combinations** | | **4** | **5** | **2** | **6** | **11** | **6** | **4** |

### *Chlorpyrifos and Diazinon*

The work done by the Central Coast Watershed Studies at California State University, Monterey Bay (CCoWS, 2004), provides the data and analysis for the bulk of the discussion that follows. Work by Hunt (2000) provides detailed toxicity analysis for certain listed and unlisted waterbodies. The California Department of Pesticide Regulation (CDPR) also has collected water quality data for chlorpyrifos and diazinon in waterbodies in the lower Salinas Valley in 1994, 1995 and during the summer of 2003.

The CCoWs study established 9 different sites on listed waterbodies. Elkhorn Slough and Moro Cojo Slough were not included in the study because there is no existing data that indicates that chlorpyrifos and diazinon are a problem in these waterbodies and the CDPR Pesticide Use Report data indicate that these pesticides are not used extensively in these watersheds. Twelve samples were collected at each site during the summer dry seasons of 2002-2003 and 3 samples were collected at each site during storms occurring in November 2002, February and March 2003. Each sample consisted of a water column, a suspended sediment sample and a bottom sediment sample that were analyzed for chlorpyrifos and diazinon concentrations using enzyme-linked immunosorbant assays (ELISA) technology. Some samples were analyzed using Gas Chromatography/Mass Spectrometry (GC/MS) techniques as part of the Quality Assurance program. Water column samples are considered to be grab samples, therefore they are compared to the Criterion Maximum Concentration (CMC).

The Hunt study selected 18 sites within the Lower Salinas Valley to sample. Each site was sampled 15 times between September 1998 and January 2000 and each sample was tested for toxicity using *Ceriodaphnia dubia* survival tests. Chemical analyses were performed on all samples from 8 rounds of sampling. A portion of those samples were analyzed for organophosphorus pesticides, organochlorine pesticides, PCBs, carbamate pesticides, polynuclear aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs). Toxicity Identification Evaluations (TIEs) were performed on ten samples in order to determine various characteristics of the samples.

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The California Department of Pesticide Regulation took water samples in 1994 and 1995 at two points in the Salinas River and one site in the Salinas River Lagoon. They also took 16 even interval samples in the summer of 2003 at 4 sites within the lower Salinas River Valley (see Table 3-5). As with the CCoWS data, water column samples are considered to be grab samples, therefore they are compared to the Criterion Maximum Concentration (CMC).

Regional Board staff took a one day snap shot of water column data above and below the City of Salinas. Five samples were taken at five different sites in July 2004. This data was used as necessary in the assessment.

The CCoWS report qqqApp# and the Hunt report qqqApp# are included as appendices to this report. CDPR data is located in qqqApp#

### *Approach and Methods*

Table 3-3 summarizes the process used by staff to determine if the available data indicates that a TMDL is required to be developed for certain pesticides. The approach for this analysis differs from the approach for the legacy pesticides/priority organics because the data is more current and it was collected in a way to facilitate comparison to numeric targets for chlorpyrifos and diazinon. Also, for this dataset the Water Quality Category is the only one that applies, so an exceedance of two out three Tier 2 categories is not appropriate, as it was for the legacy pesticide analysis.

Using Tier 1, for staff to determine if a waterbody requires a TMDL for currently registered pesticides, water column samples had to exceed the numeric target more than once in any three-year period and in more than 10% of the samples, or a Toxicity Identification Evaluation (TIE) had to identify the specific pesticides that were causing toxicity, or one sample exceeded the appropriate numeric target by more the 20x. qqqMakesurethisistrue Most of the waterbodies require TMDLs for chlorpyrifos and diazinon based on multiple exceedances of the numeric target within the past 3 years.

Using Tier 2, for staff to determine if a waterbody requires a TMDL for currently registered pesticides, water column samples had to exhibit toxicity with a corresponding water chemistry exceedance of a numeric target and exceedance of a numeric target of a separate sample.

Table 3-3 Currently Registered Pesticide TMDL Decision Matrix

| | *Water Quality Category* |
|---|---|
| <u>Tier 1</u><br>Impairment to Aquatic Life | >10% and 2 or more samples [A] exceed numeric target values within last 3 years<br>OR<br>Water TIEs clearly demonstrate toxicant (data ≤ 10 years old)<br>OR<br>1 sample > 20x numeric target value (data ≤ 10 years old) |
| <u>Tier 2</u><br>Possible Effects to Aquatic Life | One or more samples [A] exceed applicable numeric target values (data ≤ six years old)<br><br>***<u>AND</u>***<br>***<u>From a separate sample</u>***:<br><br>Toxicity evident and associated water chemistry results exceed numeric target values, but no TIEs<br>(data ≤ 6 years old) |

[A] >10% <u>and</u> "two or more" from EPA 305(b) guidance (1997), section 3.2.4 on toxics in water samples.
[B] 25% from Consolidated Assessment and Listing Methodology guidance (EPA draft report 2001b).

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### *Findings*

Staff evaluated the data collected during the CCoWS study, the CDPR study and the Hunt study using the weight of evidence approach outlined in Table 3-3. The initial data review compared data from the CCoWS and CDPR studies to the numeric targets for the Criterion Maximum Concentration (see Table 3-4 and Table 3-5) and found that all waterbodies that had been monitored exceeded the numeric target two or more times in the past 3 years, and more than 10% of the time for chlorpyrifos and diazinon. Therefore these waterbodies require a TMDL for chlorpyrifos and diazinon, with the exception of Moss Landing Harbor, South for diazinon and the Salinas Reclamation Canal, Upper/ Alisal Creek for chlorpyrifos. There is no CMC for diazinon in saltwater, and staff has identified Moss Landing Harbor, South as saltwater, therefore its diazinon data has not been compared to the CMC and the analysis results of this data are not included in Table 3-4. The Salinas Reclamation Canal, Upper/ Alisal Creek only exceeded the numeric target for chlorpyrifos once in 16 samples taken by CDPR and did not exceed the numeric target for chlorpyrifos in the one sample take by staff.

Table 3-4 Percentage Water Column Samples Above the Test's EDL that Exceed the Numeric Target for the Criterion Maximum Concentration (2002-2003 data) qqqNeed to talk about possible poor results for Chlorpyrifos. Many hits with ELISA with no hit with GCMS.

| Waterbody | Site | # of All Samples Exceeding Chlorpyrifos CMC (20 ng/L) | % of All Samples Exceeding Chlorpyrifos CMC (20 ng/L) | # of All Samples Exceeding Diazinon CMC (160 ng/L) | % of All Samples Exceeding Diazinon CMC (160 ng/L) | Number of Samples |
|---|---|---|---|---|---|---|
| Salinas River | SAL-DAV | 16 | 76% | 6 | 29% | 21 |
| Salinas River Lagoon, North | SAL-MON | 10 | 56% | 2 | 11% | 18 |
| Blanco Drain | BLA-COO | 17 | 81% | 5 | 24% | 21 |
| Blanco Drain | BLA-PUM | 13 | 72% | 5 | 28% | 18 |
| Salinas Reclamation Canal, Lower | REC-JON | 21 | 100% | 20 | 95% | 21 |
| Old Salinas River Estuary | OLS-POT | 18 | 86% | 7 | 33% | 21 |
| Moss Landing Harbor, South | MOS-SAN | 17 | 94% | | | 18 |
| Espinosa Slough | EP1-ROG | 21 | 100% | 20 | 95% | 21 |
| Espinosa Slough | EPL-EPL | 13 | 81% | 1 | 6% | 16 |

*Source: modified from CCoWS (2004), derived from data in Table 7.3 pp.69-76*

Table 3-5 California Department of Pesticide Regulation Surface Water Data (2003)

| Waterbody | Site | # of All Samples Exceeding Chlorpyrifos CMC (20 ng/L) | % of All Samples Exceeding Chlorpyrifos CMC (20 ng/L) | # of All Samples Exceeding Diazinon CMC (160 ng/L) | % of All Samples Exceeding Diazinon CMC (160 ng/L) | Number of Samples |
|---|---|---|---|---|---|---|
| Salinas Reclamation Canal, Upper/Alisal Creek | @ Moffett St. | 1 | 6% | 16 | 100% | 16 |
| Chualar Creek | @ Chualar River Rd. | 12 | 75% | 6 | 38% | 16 |
| Quail Creek | Btwn. Spence & Potter Rds. | 16 | 100% | 9 | 56% | 16 |

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| Waterbody | Site | # of All Samples Exceeding Chlorpyrifos CMC (20 ng/L) | % of All Samples Exceeding Chlorpyrifos CMC (20 ng/L) | # of All Samples Exceeding Diazinon CMC (160 ng/L) | % of All Samples Exceeding Diazinon CMC (160 ng/L) | Number of Samples |
|---|---|---|---|---|---|---|
| Blanco Drain | @ Cooper Rd. | 1 | 6% | 8 | 50% | 16 |

*Source: CDPR Surface Water Database, downloaded November 2004*

The Hunt study performed toxicity tests on eight sites within the Lower Salinas Valley. Seven of the sites are in waterbodies that were sampled during the CCoWS study, although one of Salinas River sites was further upstream than any of the CCoWS sites. This site is significant because there were no toxic results in any of the samples taken, so it sets the upstream limit for the extent of the TMDL for chlorpyrifos and diazinon. Another site that is significant is Site 6, on Quail Creek (this site was not identified by name in the original report, but was in the subsequent report). This site exhibited 100% toxicity, 100% of the time. A subsequent study showed how the discharge from Quail Creek impacted the Salinas River downstream of its confluence with the Salinas.

The Hunt study monitoring sites were located on some of the same waterbodies as the CCoWS and CDPR sites. The data was reviewed to see if it contained any information that would require a TMDL on these waterbodies for any other pesticides. There was not any evidence to require a TMDL for any other pesticides. The Hunt study did not include a site on the Salinas Reclamation Canal, Upper/Alisal Creek, therefore it could not affect the analysis for chlorpyrifos done on that waterbody.

NTR: is this a good approach for Tembladero Slough? Tembladero Slough was not sampled in any of these studies but staff feels it requires a TMDL because of its location downstream of the Salinas Reclamation Canal and upstream of the Old Salinas River Estuary, both waterbodies that exceed the CMC for diazinon and chlorpyrifos in at least 33% of their samples, indicates that it would likely exceed the CMC for both pesticides a high percentage of the time.

The results of the evaluation of data from the above studies and data sources are shown in Table 3-6. Any waterbody/pollutant combination that has an "X" in its corresponding box requires a TMDL to be developed because there was an exceedance of the relevant criteria used in the weight-of-evidence approach.

Table 3-6 Chlorpyrifos and Diazinon Waterbody/Pollutant Combinations that Require TMDLs

| No. | Waterbody Name | Current 303(d) List Pollutant(s) | Chlorpyrfos | Diazinon |
|---|---|---|---|---|
| 3b | Moss Landing Harbor, South | Pesticides | X | |
| 4 | Old Salinas River Estuary | Pesticides | X | X |
| 5 | Tembladero Slough | Pesticides | X | X |
| 6a | Salinas Reclamation Canal, Lower | Pesticides, Priority Organics | X | X |
| 6b | Salinas Reclamation Canal, Upper/ Alisal Creek | Pesticides, Priority Organics | | X |
| 7 | Espinosa Slough | Pesticides, Priority Organics | X | X |
| 8 | Salinas River Refuge Lagoon (South) | Pesticides | | |
| 9 | Salinas River Lagoon (North) | Pesticides | X | X |
| 10 | Salinas River | Pesticides | X | X |
| 11 | Blanco Drain | Pesticides | X | X |
| 14 | Quail Creek | Not currently | X | X |

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| No. | Waterbody Name | Current 303(d) List Pollutant(s) | Chlorpyrfos | Diazinon |
|---|---|---|---|---|
| | | listed. | | |
| 15 | Chualar Creek | Not currently listed. | X | X |
| | | Total waterbody/pollutant combinations | 10 | 10 |

NTR: should we add Quail Creek and Chualar Creek to the 303(d) or just deal with them in the implementation and monitoring plan?

# 4. Source Analysis

The source analysis has two components, one for legacy pesticides/priority organics and another for chlorpyrifos and diazinon.

### *Non-point Sources*

There are no active applications of legacy pesticides/priority organics, so the sources associated with these compounds are the existing residues in soils and bottom sediment. These compounds are typically attached to fine particles, such as clays, and organic material. The compounds are usually not found in the water column. Potential source areas were identified based on soil characteristics and those source areas were correlated to various land use types.

Chlorpyrifos and diazinon are actively applied and can be found in the water column, the suspended sediment in the water column and the bottom sediments. Agricultural application location and amount can be tracked using the Pesticide Use Report (PUR) provided by the Department of Pesticide Regulation. Applications of currently registered pesticides are reported at the section, or square mile, level. The PUR allows for fairly accurate identification of sources in time and space.

### *Point Sources*

There are five facilities that discharge into the Salinas Reclamation Canal via the City of Salinas' stormwater system. Three of the facilities are covered by a general low threat discharge permit under the National Pollutant Discharge Elimination System (NPDES), permit CAG993001. The two other facilities have individual NPDES permits.

The facilities' permits were reviewed to see if they may be potential sources of legacy pesticides, chlorpyrifos or diazinon. The results are discussed below.

The City of Salinas has a Phase 1 Stormwater NPDES permit. Urban uses and other non-agricultural uses can not be located using the PUR database. Use levels and potential impacts to water quality are inferred by studies performed in other parts of the state for similar land uses. Non-agricultural use of chlorpyrifos and diazinon has been severely restricted in recent years, and it is anticipated that these non-agricultural sources have decreased and will continue to decrease in the future. The restrictions on use are discussed in more detail in the Implementation and Monitoring section.

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## 4.1. Legacy Pesticides/Priority Organics

### *Approach and Methods*

#### *Non-Point and Storm Water Sources*

The location and types of land uses that are potential non-point source areas for legacy pesticides/priority organics were identified using soils data and land use/land cover data in a Geographic Information System (GIS) (see Figure 4-2).

Potential source areas of legacy pesticides/priority organics were identified based on soil characteristics as given in the Monterey County Soil Survey published by the Soil Conservation Service (now Natural Resources Conservation Service) and the GIS based Soil Survey Geographic (SSURGO) database for soils. Using GIS, these potential source areas were located geographically within the legacy pesticide/priority organics watersheds (see Figure 4-2 Center).

Two soil characteristics were used to identify soils of concern. Soils where clay constitutes more than 40% of the surface layer based on surface texture. This value was chosen because it was representative of soils in the Blanco Drain watershed that are known to contain elevated levels of DDT. There are three surface textures that have a clay content greater than 40%: clay, silty-clay and sandy-clay (see Figure 4-1). Two of these were found in the legacy pesticides/priority organic watersheds: clay and silty-clay. The texture identified as “muck” in the soil survey data was also included in the source analysis because it consists of fine particles and organic matter.

Once the soils that represent potential source areas were identified, the soil data layer was overlain with the land use layer in order to identify the various land categories that overlay the potential source areas. The land use layer that was used was the National Land Cover Data (MRLC, 1992) previously discussed in Section 2.1.

Approximately 23,000 acres have been identified as potential source areas based on this analysis. Agriculture land uses cover approximately 81% (18,600 acres) of the potential source areas, while other land uses cover 19% (4,400 acres). Table 4-1 displays the results of the analysis by watershed. The Salinas River (4,675 acres), Blanco Drain (3,580 acres) and Alisal Slough (2,276 acres) watersheds have the largest agricultural potential source areas based on acreage, while Blanco Drain (43%), Alisal Slough (60%) and the Salinas Reclamation Canal, Lower (29%) have the largest agricultural potential source area based on percent of watershed as source area. Since the other land uses cover about 20%

Approximately 1,500 acres within the City of Salinas is a potential source of legacy pesticides and priority pollutants.

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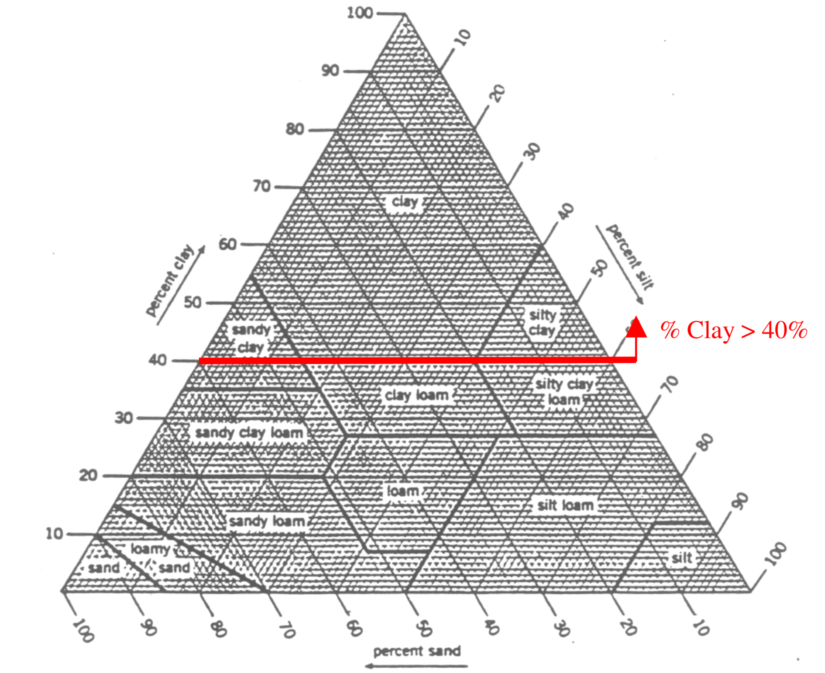


Figure 4-1 Soil Texture Triangle showing textures with % clay > 40%

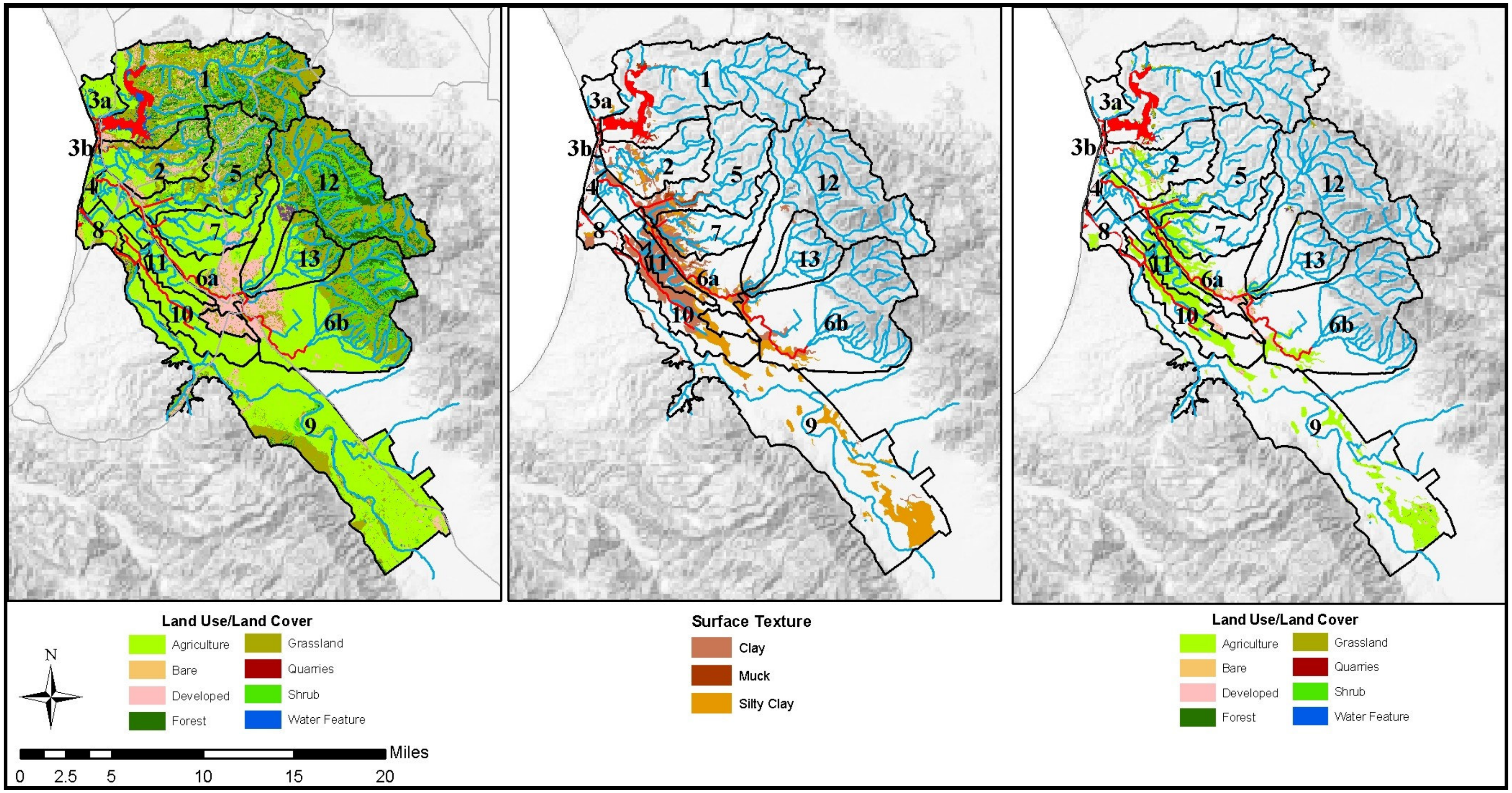


Figure 4-2 Non-Point Source Analysis: Left shows land use; Center shows soils with high probability of containing legacy pesticides/priority organics; Right shows land uses that overlay soils with high probability of containing legacy pesticides/priority organics.

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Table 4-1 Legacy Pesticide Non-Point Source Analysis

| WS# | Watershed Name | Watershed Total Acres (A) | LU/LC | LU/LC Total Acres (B) | LU/LC % of Watershed (C= B/A) | Source Acres (D) | Source Area as % of LU/LC (E=D/B) | Source Area as % of Watershed (F=D/A) |
|---|---|---|---|---|---|---|---|---|
| 1 | Elkhorn Slough | 30,330 | Agriculture | 3,978 | 13% | 68 | 2% | 0% |
| | | | Other | 24,366 | 80% | 428 | 2% | 1% |
| 2 | Moro Cojo Slough | 9,732 | Agriculture | 3,305 | 34% | 725 | 22% | 7% |
| | | | Other | 6,254 | 64% | 484 | 8% | 5% |
| 3a | Moss Landing Harbor, North/Bennett Slough | 2,796 | Agriculture | 2,081 | 74% | 34 | 2% | 1% |
| | | | Other | 549 | 20% | 26 | 5% | 1% |
| 3b | Moss Landing Harbor, South | 273 | Agriculture | 16 | 6% | | | |
| | | | Other | 190 | 70% | | | |
| 4 | Old Salinas River Estuary | 1,462 | Agriculture | 1,195 | 82% | 193 | 16% | 13% |
| | | | Other | 258 | 18% | 5 | 2% | 0% |
| 5 | Tembladero Slough | 16,737 | Agriculture | 5,325 | 32% | 1,357 | 25% | 8% |
| | | | Other | 11,213 | 67% | 635 | 6% | 4% |
| 6a | Salinas Reclamation Canal, Lower | 6,563 | Agriculture | 3,669 | 56% | 1,928 | 53% | 29% |
| | | | Other | 2,893 | 44% | 554 | 19% | 8% |
| 6b | Salinas Reclamation Canal, Upper/Alisal Creek | 29,601 | Agriculture | 11,637 | 39% | 1,255 | 11% | 4% |
| | | | Other | 17,956 | 61% | 721 | 4% | 2% |
| 7 | Espinosa Slough | 8,646 | Agriculture | 7,007 | 81% | 1,939 | 28% | 22% |
| | | | Other | 1,556 | 18% | 14 | 1% | 0% |
| 8 | Salinas River Lagoon, North | 3,058 | Agriculture | 2,160 | 71% | 236 | 11% | 8% |
| | | | Other | 750 | 25% | 50 | 7% | 2% |
| 9 | Salinas River | 41,709 | Agriculture | 30,041 | 72% | 4,675 | 16% | 11% |
| | | | Other | 11,522 | 28% | 914 | 8% | 2% |
| 10 | Blanco Drain | 8,300 | Agriculture | 7,702 | 93% | 3,560 | 46% | 43% |
| | | | Other | 598 | 7% | 194 | 32% | 2% |
| 11 | Alisal Slough Remnant (Rec Canal) | 3,703 | Agriculture | 3,514 | 95% | 2,216 | 63% | 60% |
| | | | Other | 189 | 5% | 80 | 42% | 2% |
| 12 | Gabilan Creek | 27,713 | Agriculture | 3,559 | 13% | 187 | 5% | 1% |
| | | | Other | 24,150 | 87% | 175 | 1% | 1% |
| 13 | Natividad Creek | 7,405 | Agriculture | 3,583 | 48% | 180 | 5% | 2% |
| | | | Other | 3,804 | 51% | 126 | 3% | 2% |
| | Total Agriculture | | | | | 18,553 | | |
| | Total Other | | | | | 4,406 | | |

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Table 4-2 Breakdown of “Other” LULC Category (source area > 50 acres)

| WS # | Watershed | LULC | Source Acres | Development Notes |
|---|---|---|---|---|
| 1 | Elkhorn Slough | Grassland | 317 | |
| 2 | Moro Cojo Slough | Developed | 107 | Mobile Home Park, SFR development where 156 is adjacent to MC Slough. Industrial development along Dolan Road. |
| 2 | Moro Cojo Slough | Grassland | 298 | |
| 2 | Moro Cojo Slough | Shrub | 52 | |
| 5 | Tembladero Slough | Grassland | 259 | |
| 5 | Tembladero Slough | Shrub | 301 | |
| 6a | Salinas Reclamation Canal, Lower | Developed | 421 | City of Salinas |
| 6a | Salinas Reclamation Canal, Lower | Grassland | 62 | |
| 6b | Salinas Reclamation Canal, Upper/Alisal Creek | Developed | 510 | City of Salinas |
| 6b | Salinas Reclamation Canal, Upper/Alisal Creek | Grassland | 142 | |
| 10 | Salinas River | Bare | 74 | |
| 10 | Salinas River | Developed | 435 | City of Salinas, Spreckels |
| 10 | Salinas River | Grassland | 268 | |
| 10 | Salinas River | Shrub | 97 | |
| 11 | Blanco Drain | Developed | 135 | City of Salinas, scattered |
| 13 | Gabilan Creek | Developed | 54 | City of Salinas |
| 13 | Gabilan Creek | Grassland | 62 | |
| 14 | Natividad Creek | Developed | 51 | City of Salinas |
| 14 | Natividad Creek | Grassland | 56 | |
| | Total Other | | 3,701 | |

### *Point Sources*

The five facilities that are point sources that discharge to listed waterbodies are listed in

Table 4-3. The facilities all discharge to the Salinas Reclamation Canal, Upper/Alisal Creek, either directly or through the City of Salinas’s storm drain system.

The legacy pesticides/priority pollutants of concern for the Salinas Reclamation Canal are p,p’-DDT-Total (the sum of p,p’-DDD, p,p’-DDE and p,p’-DDT), dieldrin, PCB-Total, and toxaphene while other downstream waters are listed for p,p’-DDD, p,p’-DDE and p,p’-DDT.

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Table 4-3 Point Sources in Salinas Waterbodies

| WDID | FACILITY | ADDRESS | CITY | ORDER | NPDES | EXPIRES | Discharges to |
|---|---|---|---|---|---|---|---|
| 3 270101003 | COOL PACIFIC LAND CO | AIRPORT BLVD | SALINAS | 01-119 | CAG993001 | 12/7/2006 | Salinas Reclamation Canal, Upper/Alisal Creek |
| 3 272016001 | UNI-KOOL SALINAS FACILTY | 395 WEST MARKET ST | SALINAS | 01-119 | CAG993001 | 12/7/2006 | Salinas Reclamation Canal, Upper/Alisal Creek |
| 3 272021001 | P&O Cold Logistics | 950 S. Sanborn Rd. | Salinas | 01-119 | CAG993001 | 12/7/2006 | Salinas Reclamation Canal, Upper/Alisal Creek |
| 3 271042001 | GROWERS ICE COMPANY | 1060 GROWERS ST | SALINAS | 01-016 | CA0008069 | 3/23/2006 | Salinas Reclamation Canal, Upper/Alisal Creek |
| 3 272009001 | Uni-Kool Co. – Abbott Street | E. John St. & Abbot St (320 John St.) | Salinas | 99-068 | CA0005720 | 9/7/2004 | Salinas Reclamation Canal, Upper/Alisal Creek |

### *Cool Pacific Land Company*

The Cool Pacific Land Company discharges up to 750 gallons of condensate from refrigeration equipment into the Salinas Reclamation Canal, Upper/Alisal Creek (qqqCould not verify endpoint of discharge from permit file) via the City of Salinas's storm water system. This is done under a general, low threat permit. Staff has determined, based on the source of the discharge, that this discharge is not a source of any of the pollutants of concern for this TMDL.

### *Uni-Kool Company – West Market Street*

The Uni-Kool Company – West Market Street facility in Salinas discharges up to 5,000 gallons per day of cooling tower water and evaporative condensate to the Salinas Reclamation Canal, Upper/Alisal Creek via the City of Salinas's storm water system. This is done under a general, low threat permit. Monitoring reports were reviewed for this facility by staff. Monitoring does not include analysis for any pesticides or priority pollutants, but there was one toxicity test using conducted in July 2004 that indicates the effluent is not toxic. Staff has determined, based on the source of the discharge, that this discharge is not a source of any of the pollutants of concern for this TMDL.

### *P&O Cold Logistics*

The P&O Cold Logistics facility (formerly CS Integrated, LLC) at 950 S. Sanborn Rd., Salinas, is permitted to discharge up to 40,000 gallons per day of cooling tower water, 3 days per week, into the Salinas Reclamation

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Canal, Upper/Alisal Creek via the City of Salinas's storm water system. This is done under a general, low threat permit. Staff has determined, based on the source of the discharge, that this discharge is not a source of any of the pollutants of concern for this TMDL.

### *Grower's Ice Company*

Grower's Ice Company's current permit allows for the discharge of up to 50,000 gallons per day from the following activities/equipment: ice manufacturing, evaporative condensers, ice injectors and vacuum tube pre-cooling. The effluent is discharged to the Salinas Reclamation Canal, Upper/Alisal Slough via the City of Salinas's storm water drainage system under an individual NPDES permit.

As of June 19, 2002, the handling of the facility's effluent has been changed. During the dry season, the effluent is pumped into the City of Salinas Industrial WWTP so there is no discharge. During the wet season the connection to the WWTP is closed and storm water is directed to the storm water drainage system. There is chance that effluent will be commingled with storm water discharge during the rainy season, although operations slowdown significantly between November and March during the wet-season.

Based on the fact that there is no discharge during the dry season, and wet season discharges will consist almost entirely of storm water run-off, staff does not consider this facility to be a source of legacy pesticides or priority pollutants.

### *Uni-Kool Company – Abbott Street Facility*

The Uni-Kool Company – Abbott Street facility in Salinas, discharges up to 100,000 gallons per day into the Salinas Reclamation Canal, Upper/Alisal Creek under an individual NPDES permit. The facility recently sampled its wastewater from their pond during June, August and September. Results showed no detection of DDT, dieldrin, PCB's or toxaphene. A toxicity test performed in July 2004, using water fleas (Ceriodaphnia dubia), showed that the effluent was not toxic.

It should be noted that the reporting limits as described in Section 2.4 of the Policy of the Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SWRCB, 2000, pp.23-27) for the pollutants shown in Table 4-4 were not met, therefore it can not be stated with confidence that these pollutants are not present in the discharge, but, based on the toxicity test, we can say that they are not present in amounts toxic to water fleas. Staff does not feel that this facility is a source of legacy pesticides or priority pollutants.

Table 4-4 Uni-Kool Company – Abbott Street Facility Reporting Limit vs. Minimum Level

| Pollutant | Sample Date | Reporting Limit (from sample analysis report) | Minimum Level (from SWRCB 2000) |
|---|---|---|---|
| 4,4'-DDT | 6/3/2004 | 0.05 µg/L | 0.01 µg/L |
| Dieldrin | 6/3/2004 | 0.05 µg/L | 0.01 µg/L |
| PCB's (1016, 1221, 1232, 1242, 1248, 1254, 1260) | 6/3/2004 | 1.0 µg/L | 0.5 µg/L |
| Toxaphene | 6/3/2004 | 1.0 µg/L | 0.5 µg/L |
| 4,4'-DDT | 8/10/2004 | 0.05 µg/L | 0.01 µg/L |
| PCB's (1016, 1221, 1232, 1242, 1248, 1254, 1260) | 8/10/2004 | 1.0 µg/L | 0.5 µg/L |
| Toxaphene | 8/10/2004 | 1.0 µg/L | 0.5 µg/L |
| 4,4'-DDD | 9/13/2004 | 0.1 µg/L | 0.05 µg/L |
| 4,4'-DDE | 9/13/2004 | 0.1 µg/L | 0.05 µg/L |
| 4,4'-DDT | 9/13/2004 | 0.1 µg/L | 0.01 µg/L |

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| | | | |
|---|---|---|---|
| Dieldrin | 9/13/2004 | 0.1 µg/L | 0.01 µg/L |
| PCB's (1016, 1221, 1232, 1242, 1248, 1254, 1260) | 9/13/2004 | 1.0 µg/L | 0.5 µg/L |
| Toxaphene | 9/13/2004 | 1.0 µg/L | 0.5 µg/L |

### *Findings*

Potential source areas identified in the analysis include agricultural fields (~18,500 acres) and other land uses (~4,500 acres). The majority of the source area lies in and around the City of Salinas and to the northwest of the city in the Blanco Drain, Alisal Slough, Tembladero Slough and Reclamation Canal drainages.

The "Other" category of land uses was broken down within watersheds for land uses with cumulative area greater than 50 acres in order to better characterize the type of land uses that are potential source areas. The majority of the developed land use, which constitutes approximately 1,700 acres, falls within the city limit of the City of Salinas. There are also small developed areas around Spreckels and Moro Cojo Slough near State Route 156 that are potential source areas. Grassland and shrubland account for most of the remaining potential source areas.

The City of Salinas has a Phase I Storm Water NPDES permit. The permit has been in place for 5 years with no requirement for toxicity testing or analysis for legacy pesticides or priority organics, therefore it has not been verified if the City is a significant source of legacy pesticides/priority organics.

Facility point sources are not significant sources of legacy pesticides or priority pollutants.

Another potential source area not characterized in the analysis is the bottom sediment of the waterbodies themselves. Many of the sloughs and low energy waterbodies in the area contain fine bottom sediments that contain various concentrations of legacy pesticides. One waterbody of interest in this respect is the length of the Salinas Reclamation Canal located above Carr Lake and below the lateral that connects to the canal near La Guardia Rd by the airport. This section is approximately 3 ¾ miles long and has an average gradient of 0.001 ft/ft. It appears to act as a settling area for fine sediment that may get resuspended during large storms. The bottom sediments should be characterized and their volume estimated to see if it is a hot spot that is amenable to clean-up.

## 4.2. Chlorpyrifos and Diazinon

### *Approach and Methods*

Source analysis for chlorpyrifos and diazinon was performed using the Pesticide Use Report provided by the Department of Pesticide Regulation. 2002 application data is the most current dataset as of November, 2004, so it was used in the analysis. This analysis only includes agricultural pesticide applications. The analysis was confined to the lower Salinas Valley because monitoring data indicate that the Salinas River upstream of its confluence with Quail Creek does not exceed the current numeric targets and/or does not cause toxicity.

Urban contributions are estimated based on data from other urban areas within the state since we don't have specific data that segregates the urban contribution from the agricultural contribution. The only urban area included in this analysis is the City of Salinas, since data do suggest that there may be contributions from the City.

For the agricultural source analysis, the PUR data is reported at the section (square mile) level in pounds of chemical applied. Using a Geographic Information System, sections, and portions of sections, where assigned to specific watersheds. This allowed the application data to be summed at the watershed level.

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Where watershed boundaries cross a section, the amount of the chemical applied is apportioned based on the ratio of the area of the section lying within a watershed divided by the original area of the section. For example, if 100 lbs of diazion was applied to a section, and half of that section lies in the Quail Creek watershed, then 50 lbs (100 lbs x 0.50 = 50 lbs) of diazinon would be apportioned to the Quail Creek watershed.

Analysis performed by CSUMB (CCoWS, 2004, p.50) indicates that the total summer low-flow load represents approximately 0.01% (1 lb in 10,000 lbs) of the amount of chlorpyrifos and diazinon applied. The low-flow load consists mostly of the pesticide in the water column, while a small percentage of the load is in the form of the chemical attached to the suspended sediment. While this appears to be a very small percentage, it is still enough to cause exceedances of the numeric targets.

The percentage of applied chemicals that make up the total ambient load was higher for a small watershed that contained greenhouses as well as row crop production. In this case, the majority of the total load was in the form of the pesticide attached to suspended sediment. The suspended sediment consisted of soil particles, bark and what appeared to be soil amendments. Although the estimates for the small watershed have significant uncertainties because of uncertainties in the parsing the application data as well as uncertainties with estimating the total load, the percentages were significantly higher than for the larger watersheds (6% for chlorpyrifos and 41% for diazinon). There are two possibilities for why this might be. Measuring the runoff directly from the fields does not allow time for any degradation of the pesticide to take place, therefore the high numbers may be due to the close proximity of the monitoring point to the point of application. Also, runoff from certain types of greenhouses has been shown to consistently contain high levels of pesticides qqqGetReference.

### *Points Sources*

Table 4-5

| Pollutant | Sample Date | Reporting Limit (from analysis report) | Desired Reporting Limit |
|---|---|---|---|
| Chlorpyrifos | Not Analyzed | | |
| Diazinon | 8/10/2004 | 1.0 µg/L | 0.05 µg/L |
| Chlorpyrifos | 9/13/2004 | 0.50 µg/L | 0.007 µg/L |
| Diazinon | 9/13/2004 | 0.50 µg/L | 0.05 µg/L |

### *Findings*

Table 4-6 and Table 4-7 display the results of the watershed level analysis for the 2002 agricultural application data for diazinon and chlorpyrifos, respectively. Figure 4-3 and Figure 4-4 display the application data graphically.

Table 4-6 2002 Agricultural Diazinon and Chlorpyrifos Use by Watershed

| WS Number | Watershed | Watersehed Area (Acres) | Diazinon (lbs Applied) | Chlorpyrifos (lbs Applied) |
|---|---|---|---|---|
| 3b | Moss Landing Harbor, South | 274 | 37 | 3 |
| 4 | Old Salinas River Estuary | 1,463 | 274 | 30 |
| 5 | Tembladero Slough | 16,737 | 3,044 | 530 |
| 6a | Salinas Reclamation Canal, Lower | 6,563 | 5,138 | 911 |
| 6b | Salinas Reclamation Canal, Upper/Alisal Creek | 29,662 | 8,706 | 2,431 |
| 7 | Espinosa Slough | 8,646 | 6,811 | 940 |

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| WS Number | Watershed | Watersehed Area (Acres) | Diazinon (lbs Applied) | Chlorpyrifos (lbs Applied) |
|---|---|---|---|---|
| 8 | Salinas River Lagoon, North | 3,058 | 2,033 | 485 |
| 9 | Salinas River | 40,595 | 23,999 | 12,263 |
| 10 | Blanco Drain | 8,300 | 9,015 | 2,866 |
| 11 | Alisal Slough Remnant (Rec Canal) | 3,703 | 3,544 | 914 |
| 12 | Gabilan Creek | 27,713 | 1,510 | 361 |
| 13 | Natividad Creek | 7,405 | 404 | 35 |
| 14 | Quail Creek | 11,278 | 1,974 | 2,216 |
| 15 | Chualar Creek | 29,888 | 6,870 | 5,326 |

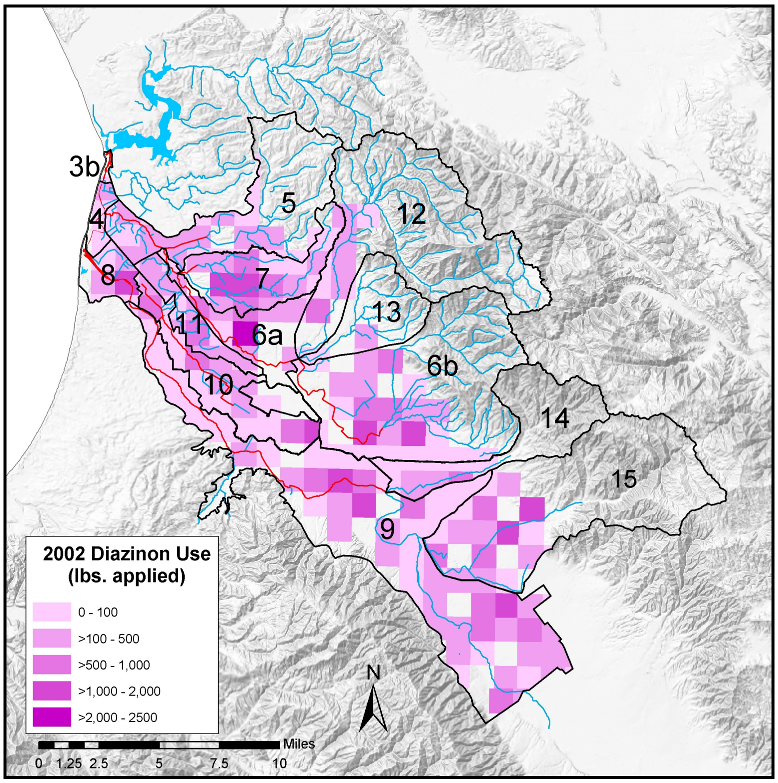


Figure 4-3 2002 Agricultural Diazinon Use

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Table 4-7 2002 Agricultural Chlorpyrifos Use by Watershed

| WS Number | Watershed Name | Watershed Area (Acres) | lbs applied |
|---|---|---|---|
| 3b | Moss Landing Harbor, South | 274 | 3 |
| 4 | Old Salinas River Estuary | 1,463 | 30 |
| 5 | Tembladero Slough | 16,737 | 530 |
| 6a | Salinas Reclamation Canal, Lower | 6,563 | 911 |
| 6b | Salinas Reclamation Canal, Upper/Alisal Creek | 29,662 | 2,431 |
| 7 | Espinosa Slough | 8,646 | 940 |
| 8 | Salinas River Lagoon, North | 3,058 | 485 |
| 9 | Salinas River | 40,595 | 12,263 |
| 10 | Blanco Drain | 8,300 | 2,866 |
| 11 | Alisal Slough Remnant (Rec Canal) | 3,703 | 914 |
| 12 | Gabilan Creek | 27,713 | 361 |
| 13 | Natividad Creek | 7,405 | 35 |
| 14 | Quail Creek | 11,278 | 2,216 |
| 15 | Chualar Creek | 29,888 | 5,326 |

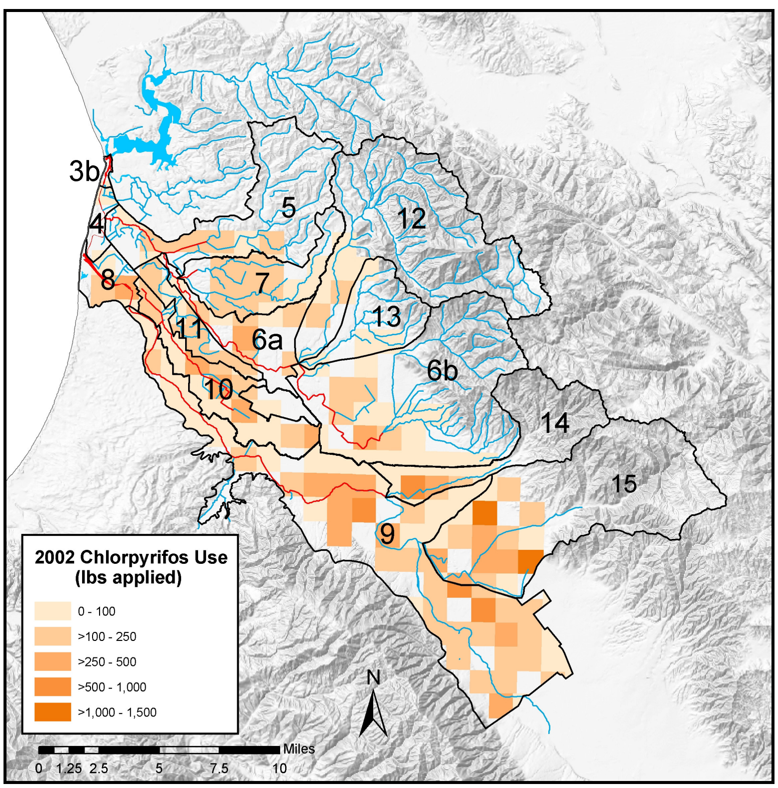


Figure 4-4 2002 Chlorpyrifos Use

Table 4-8 2002 Non-Agricultural Reported Pesticide Use

| Pesticide | Application | lbs Appl;ied |
|---|---|---|

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| Pesticide | Application | lbs Appl;ied |
|---|---|---|
| Chlorpyrifos | Landscape Maintenance | 96 |
| Chlorpyrifos | Research Commodity | 7 |
| Chlorpyrifos | Rights of Way | 86 |
| Chlorpyrifos | Structural Pest Control | 1,491 |
| Diazinon | Landscape Maintenance | 765 |
| Diazinon | Research Commodity | 1 |
| Diazinon | Rights of Way | 9 |
| Diazinon | Structural Pest Control | 1,636 |
| Diazinon | Uncultivated, non-Ag Areas | 38 |

## 4.3. Conclusions from Source Analysis

### *General Validity of Loading Estimates*

### *Considering the Source*

# 5. NUMERIC TARGETS

This section describes the numeric targets selected for the waterbodies listed in. These targets are designed to protect the beneficial uses of the listed waterbodies. Since a combination of numeric and narrative water quality objectives exist to protect beneficial uses, staff developed numeric targets that interpret or translate the narrative objectives where no numeric standards exist. Numeric targets for tissue and sediment are based on narrative water quality objectives.

## 5.1. General Discussion of Numeric Targets

Staff reviewed various criteria/screening values that could be used as numeric target values along with toxicity for assessing water quality within the three different categories of water column, sediment and tissue. Staff selected numeric target values for:

1. water column as a direct measure of water quality and to protect aquatic life and human health,
2. fish/shellfish tissue to be protective of human health for fish/shellfish consumption at the point of consumption and to be protective of ecosystem health, and
3. sediment to be protective of aquatic life.

Toxicity testing is used to assess aquatic life impairment and as a way of interpreting the narrative standard of “no toxic substances in toxic amounts.”

The numeric target values for aquatic life criteria for water column and sediment are given for freshwater (salinity <= 1 ppthousand, 95% of the time) and saltwater (salinity >= 10 ppthousand, 95% of the time) environments. Targets for brackish water (salinity between 1 and 10 ppthousand) use the more stringent of the freshwater or marine values, since both freshwater and saltwater species may inhabit brackish water. These definitions for salt- and freshwater come from the CTR (EPA, 2000, p. 31718). Based on these criteria, Table 5-1 lists the salinity category for the listed waterbodies.

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Table 5-1 Listed Waterbodies and Associated Salinity

| No. | Waterbody Name | Fresh/Salt/Brackish |
|---|---|---|
| 1 | Elkhorn Slough | Salt |
| 2 | Moro Cojo Slough | Brackish |
| 3a | Moss Landing Harbor North (Yacht Harbor)/Bennett Slough | Salt |
| 3b | Moss Landing Harbor, South | Salt |
| 4 | Old Salinas River Estuary | Brackish |
| 5 | Tembladero Slough | Brackish/Fresh |
| 6a | Salinas Reclamation Canal, Lower | Fresh |
| 6b | Salinas Reclamation Canal, Upper/Alisal Creek | Fresh |
| 7 | Espinosa Slough | Fresh |
| 8 | Salinas River Refuge Lagoon (South) | Brackish |
| 9 | Salinas River Lagoon (North) | Brackish |
| 10 | Salinas River | Fresh |
| 11 | Blanco Drain | Fresh |

Numeric target values were derived from the following sources for:

1. Water column: the California Toxics Rule (CTR) values for acute, chronic and human health were used for DDT, dieldrin, PCBs and toxaphene. For chlorpyrifos and diazinon, the California Department of Fish and Game's *Water Quality Criteria for Diazinon and Chlorpyrifos* (CDFG, 2000) was used. Diazinon criteria were modified based on the July 30, 2004 memorandum from California Department of Fish & Game (CDFG, 2004) to The Central Valley Regional Water Quality Control Board (CVRWQCB) that documents CDFG's reevaluation of their original work based on new information received by the CVRWQCB.
2. Fish/shellfish Tissue for Human Health: the minimum value from either:
    a. California Office of Environmental Health Hazard Assessment Tissue Screening Values from the California Lakes Study (OEHHA, 1999), and
    b. EPA's Recommended Screening Values for Recreational Fishers (EPA, 2000), and
    c. FDA Action and Tolerance Levels (SWRCB, 2000).
3. Fish Tissue for Protection of Wildlife
    a. National Academy of Science Fish Tissue Guidelines (NAS, 1973).
4. Bottom Sediment Quality: (NTR: EPA used TELs in Newport Bay instead of the higher PELs or ERMs. Doug used the higher PEL in Clear Creek. I have used the lower numbers in order to be conservative, but it is inconsistent with a previously approved Region 3 TMDL.)
    a. for saltwater sediment: the maximum value of the Threshold Effects Level (TEL) and the Effects Range - Low (ER-L), or the Upper Effects Threshold (UET) from NOAA SQRT (Buchman, 1999) for sediment.
    b. for freshwater sediment: the Threshold Effects Level (TEL) from NOAA SQRT (Buchman, 1999) for sediment
    c. for brackish sediment: staff first took the ***minimum*** of value between the saltwater TEL and freshwater TEL and then took the ***maximum*** of this brackish TEL and the saltwater ER-L value sediment values was used.
    d. The NOAA SQRT do not have any screening values for toxaphene, therefore the value was obtained from the New York State "Technical Guidance for Screening Contaminated Sediments (New York State, 1999, p. 24). The value that was used was the lowest value given for sediment criteria.
5. Toxicity
    Toxicity triad (toxicity test, chemistry analyses and infaunal benthic structure) is used to evaluate if a waterbody is impaired or not.

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## 5.2. Numeric Targets

NTR: Should I make a table showing the specific waterbody vs. the numeric target? Right now you have to look at the waterbody salinity table and the numeric target table in order to select the appropriate numeric target.

Table 5-2 Water Column Numeric Targets

| CTR No. | Compound | Fresh Water | | Salt Water | | Brackish Water[A] | | Human Health ($10^{-6}$ risk for carcinogens) For Consumption of:[B] | |
|---|---|---|---|---|---|---|---|---|---|
| | | CMC[C] (ppb) | CCC[D] (ppb) | CMC[C] (ppb) | CCC[D] (ppb) | CMC[C] (ppb) | CCC[D] (ppb) | Water & Organisms (ppb) | Organisms Only (ppb) |
| 108 | 4,4'-DDT | 0.55 [E] | 0.001 | 0.065 [E] | 0.001 | 0.065 [E] | 0.001 | 0.00059 | 0.00059 |
| 109 | 4,4'-DDE | | | | | | | 0.00059 | 0.00059 |
| 110 | 4,4'-DDD | | | | | | | 0.00083 | 0.00084 |
| 111 | Dieldrin | 0.24 | 0.056 | 0.36 [E] | 0.0019 | 0.24 | 0.0019 | 0.00014 | 0.00014 |
| 119-125 | PCBs | | 0.014[F] | | 0.03 [F] | | 0.014 [F] | 0.00017[G] | 0.00017 [G] |
| 126 | Toxaphene | 0.73 | 0.0002 | 0.21 | 0.0002 | 0.21 | 0.0002 | 0.00073 | 0.00075 |
| | Chlorpyrifos [H] | 0.02 | 0.014 | 0.02 | 0.009 | 0.02 | 0.009 | | |
| | Diazinon [H] | 0.16 [I] | 0.10 | | | 0.16 | 0.10 | | |

[A] Minimum of Freshwater and Saltwater Criteria
[B] *30-day average*
[C] *CMC – Criterion Maximum Concentration (1- hour average)*
[D] *CCC – Criterion Continuous Concentration (4-day (96-hour) average)*
[E] Criterion has been reduced (divided by 2) in accordance with Footnote g of Table in paragraph 131.38(b)(1) of CTR (EPA, 2000)
[F] PCBs are a class of chemicals that include aroclors 1242, 1254, 1221, 1232, 1248, 1260 and 1016, CAS numbers 53469219, 11097691, 11104282, 11141165, 12672296, 11096825, and 12674112, respectively. The aquatic life criteria apply to the sum of this set of seven aroclors.
[G] This criterion applies to total PCBs, e.g., the sum of all congener or isomer or homolog or aroclor analyses.
[H] A toxicity ratio is used to account for the additive nature of these compounds. The ratio calculation is given in Section 5.2.
[I] A maximum value of 0.100 ppb is also used for protection of outmigrating steelhead – see explanation below.

Because of the additive nature of the toxicity of chlorpyrifos and diazinon a toxicity ratio is used as the ultimate numeric target to ensure that combined presence of these two pesticides in the water column will not adversely affect beneficial uses. The toxicity ratio for an individual sample is calculated as follows:

For Chronic Toxicity: $\text{Chlorpyrifos}_{conc}/0.014 \text{ ppb} + \text{Diazinon}_{conc}/0.100 \text{ ppb} < 1$
For Acute Toxicity: $\text{Chlorpyrifos}_{conc}/0.02 \text{ ppb} + \text{Diazinon}_{conc}/0.160 \text{ ppb} < 1$

Diazinon concentration is also limited to a maximum concentration of 0.100 ppb in streams where oversummering or outmigration of steelhead exist (CVRWQCB, 2004, p. qqq). This is to account for reduced predator response that has been found to occur at values of 1 ppb, but not at values of 0.100 ppb. Since the streams that are addressed by this TMDL are not oversummering habitat for steelhead, this number should apply during the periods of outmigration of the yourng steelhead (parr and smolt) that occurs during the rainy season. Therefore this target must be met from October 15 and March 15, inclusive. (NTR: should I make the concentration rainy season specific? I believe this is when the young steelhead would be in the waterbodies of concern.)

The practical ramification of the dual numeric targets for diazinon means that during the rainy season, both targets must be met. The toxicity ratio must not exceed 1 and diazinon concentrations must not exceed 0.100 ppb.

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Table 5-3Tissue Numeric Indicator Values
(ppb, fish fillet or whole shellfish wet weight)

| Analyte | Numeric Target |
|---|---|
| DDT, Total[A] | 100 |
| Dieldrin | 2 |
| PCB, Total[B] | 20 |
| Toxaphene | 30 |
| Chlorpyrifos | 1,200 |
| Diazinon | 300 |

[A] Sum of 4,4'- and 2,4'-isomers of DDT, DDE, DDD
[B] Sum of Aroclors 1248, 1254 and 1260

Table 5-4 Fish/Shellfish Tissue Numeric Targets for Protection of Wildlife
(ug/kg whole fish/shellfish wet weight)

| Compound | Numeric Target |
|---|---|
| DDT, Total | 1000 |
| Dieldrin | 100 |
| PCB, Total of congeners | 500 |
| Toxaphene | 100 |

Table 5-5 Sediment Numeric Targets (dry weight, µg/kg)

| Contaminant | CAS No. | Freshwater µg/kg ppb | Marine µg/kg ppb | Brackish µg/kg ppb |
|---|---|---|---|---|
| *Chlorinated Dioxins & PCBs* | | | | |
| Polychlorinated Biphenyls | 1336363 | 34.1 | 22.7 | 22.7 |
| *Semivolatiles, Organochlorines* | | | | |
| p,p'-DDD | 72548 | 3.54 | 2 | 2 |
| p,p'-DDE | 72559 | 1.42 | 2.2 | 1.42 |
| p,p'-DDT | 50293 | | 1.19 | 1.19 |
| DDT, Total (p,p') | | 6.98 | 3.89 | 3.89 |
| Dieldrin | 60571 | 2.85 | 0.715 | 0.715 |
| Toxaphene | 8001352 | 10* | 10* | 10* |

*From State of New York Screening Values (New York State, 1999)
(assumes 1% Total Organic Carbon in sediment sample)

(NTR: The toxaphene number is different than the one used by EPA in Newport Bay (0.1 ppb). I'm not sure why. The New York number is 0.01 ppm, so that translates to 10 ppb)

# 6. Linkage Analysis

## 6.1. Legacy Pesticides

The loading capacities for the legacy pesticides/priority pollutants are set at the numeric target values for the water column (water + particulate), which are concentration values from the California Toxics Rule (EPA, 2000). Because the loading capacities are numeric targets that are concentrations, reduction of current "loads" to the loading capacity will assure that the numeric targets are met and the water quality impairment is removed. At this time, it assumed that meeting the water column numeric targets will be sufficient to improve sediment quality and fish/shellfish tissue quality. Long-term monitoring will need to be performed in order to test this assumption.

NTR: Newport Bay/San Diego Creek used a couple different approaches to establish loading capacities and existing loadings depending on whether the waterbody was flowing or tidally influenced. Unfortunately, we can't transfer their approaches since they require information that we just don't have at this time: flow and suspended sediment data as well as sediment deposition modeling for the tidally influenced waterbodies. The approach I have taken is simplistic, but not unreasonable. I recommend allowable loads be set at the CTR concentrations for the legacy pesticides/priority organics. The total concentration (water + particulate) for a sample would be compared to the CTR concentrations. For diazinon and chlorpyrifos the water column concentration (water only) would be used in the toxicity ratio calculation. Tissue samples and sediment samples would be used as numeric targets, but not to develop the loading capacity.

Realistically, there is not much else we can do at this time and I believe this approach is sufficient. Since all of the data in the world won't change the implementation strategy and the Newport Bay approach is untested, simple is better.

Upside: the numeric target for whole water samples is the loading capacity, therefore the linkage between the loading capacity and the numeric target is straightforward since they are same – at least for whole water.

Downside: Doesn't use sediment or tissue endpoints to develop loading capacity, therefore linkage analysis for these numeric targets cannot be performed.

## 6.2. Chlorpyrifos and diazinon

The loading capacities for chlorpyrifos and diazinon are the numeric target toxicity ratios that are based on the Criterion Maximum Concentration and the Criterion Chronic Concentration for each pesticide. Because the numeric targets are based on concentrations, the loading capacity is the numeric target and reduction of current "loads" to the loading capacity will assure that the numeric targets are met and the water quality impairment is removed.

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# 7. APPROACH TO ESTABLISHING ALLOWABLE LOADS

### *Percent Controllable through Best Management Practices*

Legacy pesticides/priority organics move through the environment attached to soil particles and organic materials. Management practices that decrease or stop erosion as well as practices that remove suspended sediment and bedload from the water column will be instrumental in attaining water quality standards for these compounds. There are numerous practices available that can be used to decrease erosion from agricultural and urban lands and many well-established practices that can be used to remove sediment from the water column. The key to success is the removal of fine sediment from the water column, since the legacy pesticides/priority organics are attached to the fines. NTR: How far do I have to go with this? Should I list practices that may be useful? Since these compounds are no longer in use (qqq with exception of DDT in dicofol?), use reduction is not an option for reducing the presence of these compounds in the water column, fish tissue and bottom sediments.

Chlorpyrifos and diazinon are currently registered pesticides that are applied in large amounts in the area covered by these TMDLs. Use reduction is a viable option for these chemicals. Any reduction in use would have the potential to reduce the amount of these chemicals in the water column. Onsite retention of agricultural return water and storm water will also reduce the amount of these chemicals in the water column and may be the most effective method short of elimination of use of these chemicals. Application techniques should be reviewed in order to minimize the risk of direct application to surface waters.

The EPA has implemented restrictions on the agricultural and non-agricultural use of chlorpyrifos and diazinon. All home uses of chlorpyrifos have been canceled with two exceptions. The use of chlorpyrifos as a termiticide is still allowed, but is limited to a 0.5% solution. Pre-construction use is still allowed, but will be canceled December 31, 2005. Non-residential uses where children could be exposed (such as parks) have been canceled. Uses that will remain include outdoor areas where children will not be exposed such as golf courses, road medians, industrial uses and non-structural wood treatments. Chlorpyrifos use will also be allowed for fire ant mounds and mosquito control. There are still non-agricultural uses that are allowed that could potentially impact water quality, therefore adequate practices will have to be employed in conjunction with these uses to prevent any impact to water quality.

For diazinon, all outdoor non-agricultural uses were canceled as of December 31, 2004. Registrants will buy back any products from retailers that remain at the end of 2004. Use of diazinon on certain crops has been canceled. qqq Question into Kathy Brunetti on status of cancellation.

## 7.1. TMDL Calculations and Allocations

### *TMDLs*

The TMDLs that are addressed in this document are concentration based TMDLs. For concentration based TMDLs, the water column numeric target is the wasteload allocation and the load allocation. When all “loads” meet the numeric target, then the TMDL has been met.

### *Allocations*

The wasteload allocations are for agricultural sources and the load allocations are for the City of Salinas’s Storm Water program. The wasteload allocations and the load allocations vary depending on the sampling timeframes being performed. When a grab sample is used the allocations equal the criterion maximum concentration (CMC);

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when a four-day average is used the allocations equal the criterion continuous concentration (CCC); and when a thirty day average is used the allocations equal the concentrations protective of human health.

## *Load Calculations*

The following is the arithmetic expression of a total maximum daily load:

**TMDL = ΣWLA + ΣLA + MOS**

Where:

WLA = wasteload allocation, or the portion of the TMDL allocated to existing or future point sources

LA = load allocation, or the portion of the TMDL allocated to existing or future nonpoint sources and natural background; and

MOS = margin of safety, or an accounting of uncertainty about the relationship between pollutant loads and receiving water quality. The MOS can be provided implicitly through analytical assumptions or explicitly by reserving a portion of loading capacity.

All of the load calculations for the various waterbody/pollutant/sampling combinations will not be shown here, since they are relatively simple calculations and their repetitive nature would not provide any insight into the derivation of the various loads. The same types of equations apply for all of the waterbody/pollutant/sampling combinations in the Final TMDL

NOTE: footnote definitions are given at end of section section, below.

The Margin of Safety is implicit in the numeric targets, therefore it is not included in the equations.

The following example is given for dieldrin in Elkhorn Slough (see Table 7-3 in the Final TMDL

NOTE: footnote definitions are given at end of sectionsection, below).

Table 7-1 Example Load Calculations for dieldrin in Elkhorn Slough
(based on water column numeric targets)

| Sample Type | WLA | LA | TMDL |
|---|---|---|---|
| Grab | <0.36 ppb | <0.36 ppb | <0.36 ppb |
| 4-day average | <0.0019 ppb | <0.0019 ppb | <0.0019 ppb |
| 30-day average | <0.00014 ppb | <0.00014 ppb | <0.00014 ppb |

For chlorpyrifos and diazinon TMDLs there are no human health concentrations available, so only the CMC and CCC apply. The numeric target for the CMC and CCC are toxicity ratios, therefore the WLA and LA are expressed in terms of the toxicity ratios. An additional requirement for diazinon applies between October 15 and March 15 when levels cannot exceed 0.100 ppb in the water column in order to protect migrating steelhead trout.

Table 7-2 Example Load Calculation for Chlorpyrifos and Diazinon

| Sample Type | WLA | LA | TMDL |
|---|---|---|---|
| Grab | Toxicity Ratio <=1 | Toxicity Ratio <=1 | Toxicity Ratio <=1 |
| 4-day average | Toxicity Ratio <=1 | Toxicity Ratio <=1 | Toxicity Ratio <=1 |

## *Final TMDL*

NOTE: footnote definitions are given at end of section

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The following tables establish the concentrations for the waterbody/pollutant combinations used in the TMDL calculation given in the previous section.

Table 7-3 TMDL for Elkhorn Slough and Moss Landing Harbor (Salt)

| | | Salt Water | | Human Health ($10^{-6}$ risk for carcinogens) For Consumption of:[B] | |
|---|---|---|---|---|---|
| **CTR No.** | **Compound** | **CMC[C] (ppb)** | **CCC[D] (ppb)** | **Organisms Only (ppb)** | **Margin of Safety** |
| 111 | Dieldrin | 0.36 [E] | 0.0019 | 0.00014 | Implicit |

Table 7-4 TMDL for Moss Landing Harbor, South (Salt)

| | | Salt Water | | Human Health ($10^{-6}$ risk for carcinogens) For Consumption of:[B] | |
|---|---|---|---|---|---|
| **CTR No.** | **Compound** | **CMC[C] (ppb)** | **CCC[D] (ppb)** | **Organisms Only (ppb)** | **Margin of Safety** |
| 108 | 4,4'-DDT | 0.065 [E] | 0.001 | 0.00059 | Implicit |
| 109 | 4,4'-DDE | | | 0.00059 | Implicit |
| 110 | 4,4'-DDD | | | 0.00084 | Implicit |
| 111 | Dieldrin | 0.36 [E] | 0.0019 | 0.00014 | Implicit |
| 119-125 | PCBs | | 0.03 [F] | 0.00017 [G] | Implicit |
| 126 | Toxaphene | 0.21 | 0.0002 | 0.00075 | Implicit |
| | Chlorpyrifos | 0.02 | 0.009 | | Implicit |

Table 7-5 TMDL for Moss Landing Harbor, North/Bennett Slough (Salt)

| | | Salt Water | | Human Health ($10^{-6}$ risk for carcinogens) For Consumption of:[B] | |
|---|---|---|---|---|---|
| **CTR No.** | **Compound** | **CMC[C] (ppb)** | **CCC[D] (ppb)** | **Organisms Only (ppb)** | **Margin of Safety** |
| 111 | Dieldrin | 0.36 [E] | 0.0019 | 0.00014 | Implicit |

Table 7-6 TMDL for Moro Cojo Slough (Brackish)

| **CTR No.** | **Compound** | **Brackish Water[A]** | **Human Health ($10^{-6}$ risk for carcinogens) For Consumption of:[B]** | **Margin of Safety** |
|---|---|---|---|---|

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| | | CMC[C] (ppb) | CCC[D] (ppb) | Organisms Only (ppb) | |
|---|---|---|---|---|---|
| 111 | Dieldrin | 0.24 | 0.0019 | 0.00014 | Implicit |

Table 7-7 TMDL for Old Salinas River Estuary (Brackish)

| | | Brackish Water[A] | | Human Health ($10^{-6}$ risk for carcinogens) For Consumption of:[B] | |
|---|---|---|---|---|---|
| CTR No. | Compound | CMC[C] (ppb) | CCC[D] (ppb) | Organisms Only (ppb) | Margin of Safety |
| 111 | Dieldrin | 0.24 | 0.0019 | 0.00014 | Implicit |
| 126 | Toxaphene | 0.21 | 0.0002 | 0.00075 | Implicit |
| | Chlorpyrifos[H] | 0.02 | 0.009 | | Implicit |
| | Diazinon[H] | 0.16[I] | 0.10 | | Implicit |

Table 7-8 TMDL for Tembaldero Slough (Brackish/Fresh)

| | | Brackish Water[A] | | Human Health ($10^{-6}$ risk for carcinogens) For Consumption of:[B] | |
|---|---|---|---|---|---|
| CTR No. | Compound | CMC[C] (ppb) | CCC[D] (ppb) | Organisms Only (ppb) | Margin of Safety |
| 108 | 4,4'-DDT | 0.065[E] | 0.001 | 0.00059 | Implicit |
| 109 | 4,4'-DDE | | | 0.00059 | Implicit |
| 110 | 4,4'-DDD | | | 0.00084 | Implicit |
| 111 | Dieldrin | 0.24 | 0.0019 | 0.00014 | Implicit |
| 119-125 | PCBs | | 0.014[F] | 0.00017[G] | Implicit |
| 126 | Toxaphene | 0.21 | 0.0002 | 0.00075 | Implicit |
| | Chlorpyrifos[H] | 0.02 | 0.009 | | Implicit |
| | Diazinon[H] | 0.16[I] | 0.10 | | Implicit |

Table 7-9 TMDL for Salinas River Lagoon, North (Brackish)

| | | Brackish Water[A] | | Human Health ($10^{-6}$ risk for carcinogens) For Consumption of:[B] | |
|---|---|---|---|---|---|
| CTR No. | Compound | CMC[C] (ppb) | CCC[D] (ppb) | Organisms Only (ppb) | Margin of Safety |
| 108 | 4,4'-DDT | 0.065[E] | 0.001 | 0.00059 | Implicit |
| 109 | 4,4'-DDE | | | 0.00059 | Implicit |
| 111 | Dieldrin | 0.24 | 0.0019 | 0.00014 | Implicit |

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| CTR No. | Compound | Brackish Water[A] CMC[C] (ppb) | CCC[D] (ppb) | Human Health ($10^{-6}$ risk for carcinogens) For Consumption of:[B] Organisms Only (ppb) | Margin of Safety |
|---|---|---|---|---|---|
| | Chlorpyrifos[H] | 0.02 | 0.009 | | Implicit |
| | Diazinon[H] | 0.16[I] | 0.10 | | Implicit |

Table 7-10 TMDL for Salinas Reclamation Canal, Lower (Fresh)

| CTR No. | Compound | Fresh Water CMC[C] (ppb) | CCC[D] (ppb) | Human Health ($10^{-6}$ risk for carcinogens) For Consumption of:[B] Organisms Only (ppb) | Margin of Safety |
|---|---|---|---|---|---|
| 108 | 4,4'-DDT | 0.55[E] | 0.001 | 0.00059 | Implicit |
| 109 | 4,4'-DDE | | | 0.00059 | Implicit |
| 110 | 4,4'-DDD | | | 0.00084 | Implicit |
| 111 | Dieldrin | 0.24 | 0.056 | 0.00014 | Implicit |
| 126 | Toxaphene | 0.73 | 0.0002 | 0.00075 | Implicit |
| | Chlorpyrifos[H] | 0.02 | 0.014 | | Implicit |
| | Diazinon[H] | 0.16[I] | 0.10 | | Implicit |

Table 7-11 TMDL for Salinas Reclamation Canal, Upper/Alisal Slough (Fresh)

| CTR No. | Compound | Fresh Water CMC[C] (ppb) | CCC[D] (ppb) | Human Health ($10^{-6}$ risk for carcinogens) For Consumption of:[B] Organisms Only (ppb) | Margin of Safety |
|---|---|---|---|---|---|
| 108 | 4,4'-DDT | 0.55[E] | 0.001 | 0.00059 | Implicit |
| 109 | 4,4'-DDE | | | 0.00059 | Implicit |
| 110 | 4,4'-DDD | | | 0.00084 | Implicit |
| 111 | Dieldrin | 0.24 | 0.056 | 0.00014 | Implicit |
| 119-125 | PCBs | | 0.014[F] | 0.00017[G] | Implicit |
| 126 | Toxaphene | 0.73 | 0.0002 | 0.00075 | Implicit |
| | Diazinon[H] | 0.16[I] | 0.10 | | Implicit |

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Table 7-12 TMDL for Espinosa Slough (Fresh)

| CTR No. | Compound | Fresh Water CMC[C] (ppb) | Fresh Water CCC[D] (ppb) | Human Health ($10^{-6}$ risk for carcinogens) For Consumption of:[B] Organisms Only (ppb) | Margin of Safety |
|---|---|---|---|---|---|
| 111 | Dieldrin | 0.24 | 0.056 | 0.00014 | Implicit |
| | Chlorpyrifos[H] | 0.02 | 0.014 | | Implicit |
| | Diazinon[H] | 0.16[I] | 0.10 | | Implicit |

Table 7-13 TMDL for Salinas River (Fresh)

| CTR No. | Compound | Fresh Water CMC[C] (ppb) | Fresh Water CCC[D] (ppb) | Margin of Safety |
|---|---|---|---|---|
| | Chlorpyrifos[H] | 0.02 | 0.014 | Implicit |
| | Diazinon[H] | 0.16[I] | 0.10 | Implicit |

Table 7-14 Blanco Drain (Fresh)

| CTR No. | Compound | Fresh Water CMC[C] (ppb) | Fresh Water CCC[D] (ppb) | Human Health ($10^{-6}$ risk for carcinogens) For Consumption of:[B] Organisms Only (ppb) | Margin of Safety |
|---|---|---|---|---|---|
| 108 | 4,4'-DDT | 0.55[E] | 0.001 | 0.00059 | Implicit |
| 109 | 4,4'-DDE | | | 0.00059 | Implicit |
| 110 | 4,4'-DDD | | | 0.00084 | Implicit |
| 111 | Dieldrin | 0.24 | 0.056 | 0.00014 | Implicit |
| 119-125 | PCBs | | 0.014[F] | 0.00017[G] | Implicit |
| 126 | Toxaphene | 0.73 | 0.0002 | 0.00075 | Implicit |
| | Chlorpyrifos[H] | 0.02 | 0.014 | | Implicit |
| | Diazinon[H] | 0.16[I] | 0.10 | | Implicit |

Table 7-15 TMDL for Quail Creek (Fresh)

| CTR No. | Compound | Fresh Water CMC[C] (ppb) | Fresh Water CCC[D] (ppb) | Margin of Safety |
|---|---|---|---|---|

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| CTR No. | Compound | Fresh Water CMC[C] (ppb) | Fresh Water CCC[D] (ppb) | Margin of Safety |
|---|---|---|---|---|
| | Chlorpyrifos [H] | 0.02 | 0.014 | Implicit |
| | Diazinon [H] | 0.16 [I] | 0.10 | Implicit |

Table 7-16 TMDL for Chualar Creek (Fresh)

| CTR No. | Compound | Fresh Water CMC[C] (ppb) | Fresh Water CCC[D] (ppb) | Margin of Safety |
|---|---|---|---|---|
| | Chlorpyrifos [H] | 0.02 | 0.014 | Implicit |
| | Diazinon [H] | 0.16 [I] | 0.10 | Implicit |

Footnotes

[A] Minimum of Freshwater and Saltwater Criteria
[B] *30-day average*
[C] *CMC – Criterion Maximum Concentration (1- hour average)*
[D] *CCC – Criterion Continuous Concentration (4-day (96-hour) average)*
[E] Criterion has been reduced (divided by 2) in accordance with Footnote g of Table in paragraph 131.38(b)(1) of CTR (EPA, 2000)
[F] PCBs are a class of chemicals that include aroclors 1242, 1254, 1221, 1232, 1248, 1260 and 1016, CAS numbers 53469219, 11097691, 11104282, 11141165, 12672296, 11096825, and 12674112, respectively. The aquatic life criteria apply to the sum of this set of seven aroclors.
[G] This criterion applies to total PCBs, e.g., the sum of all congener or isomer or homolog or aroclor analyses.
[H] A toxicity ratio is used to account for the additive nature of these compounds. The ratio calculation is given in Section 5.2.
[I] A maximum value of 0.100 ppb is also used for protection of outmigrating steelhead – see explanation below.

## *Margin of Safety*

The margin of safety for this TMDL is implicit in the water column numeric targets selected for the legacy pesticides/priority organics and for the currently registered pesticides chlorpyrifos and diazinon. Since this is a concentration-based TMDL the TMDL is the same as the numeric target for each compound.

The water column numeric targets for the legacy pesticides/priority organics are from the California Toxics Rule and are set to protect aquatic life and human health. Individual aquatic life criterion "might be thought of estimates of the highest concentration of a substance in water which does not present a significant risk to aquatic organisms in the water and their life uses" (EPA, 2000). The human health criteria are set based on carcinogenic and systemic toxicity (non-carcinogenic) effects. The criteria were developed by working backwards from the allowable human exposure to the concentration in the water column of the pollutants of interest. The criteria are based on an acceptable body burden, drinking water and fish consumption rates and a biocentration factor that relates the pollutant level in fish to the pollutant level in the water column. There are conservative assumptions built into the methods for developing the allowable body burden (i.e. cancer slope factor and reference dose rate) and conservative assumptions built into the ingestion calculation and conservative assumptions in the bioconcentration factor.

The water column numeric targets for chlorpyrifos and diazinon were developed by the California Department of Fish and Game following EPA protocols and therefore have the same conservative assumptions used in that procedure. The one exception to this is the seasonal diazinon numeric target that is based on predator response

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inhibition in salmonids. This number is conservative because it is the level at which no statistically valid effects were observed.

# 8. IMPLEMENTATION

The purpose of the Implementation Plan (Plan) is to describe the steps necessary to reduce loads of legacy pesticides/priority organics, chlorpyrifos and diazinon and achieve the TMDL. The Plan identifies: the actions that staff expects would reduce pollutant loading; the parties responsible for taking these actions; the regulatory mechanism by which the Regional Board will assure these actions are taken; reporting and evaluation requirements that will indicate progress toward completing the actions; a timeline for completion of implementation actions; and an estimate of the cost of implementation. A monitoring plan designed to measure progress toward water quality goals is included in the section that follows the Plan.

## 8.1. Implementation Actions - Legacy Pesticides/Priority Organics

Staff identified implementation actions that address the sources legacy pesticide/priority organic, which are associated with certain types of soils throughout the lower Salinas River Valley. Legacy pesticides/priority organics are attached to the soil and organic matter in the soil, therefore management measures that control erosion/sedimentation are required to be implemented. These measures, along with natural attenuation of the legacy pesticides/priority organics will assure compliance with this TMDL.

### *Agricultural Land Sources*

The Conditional Agricultural Waiver that was issued by the Central Coast Regional Water Quality Board in July 2004 is the implementing mechanism for the control of legacy pesticides/priority organics from agricultural lands identified as potential source areas in this TMDL. The agricultural waiver requires enrollees to create farm management plans that address irrigation management and erosion control. By implementing their farm plans enrollees will address erosion/sedimentation associated with irrigated agricultural lands.

Owners and/or operators of irrigated agricultural lands are the implementing parties responsible for the controlling erosion/sedimentation from agricultural land sources.

### *City of Salinas Sources*

The City of Salinas's National Pollutant Discharge Elimination System (NPDES) Storm Water Permit is the implementation mechanism for the control of legacy pesticides/priority organics from areas that have been identified as potential source areas within the City of Salinas. The City's Storm Water Permit requires management of pollutants in run-off from construction sites, new development, industrial and commercial sites, municipal properties. The permit also requires the City to implement a Public Outreach and Education effort to raise awareness of impacts of urban run-off to waters of the state and to disseminate information on management practices that are effective at mitigating those impacts.

The City of Salinas is the implementing party responsible for controlling erosion/sedimentation from urban source areas.

### *Instream Sources qqq*

*The characterization of the Salinas Reclamation Canal, Upper/Alisal Creek is a special project that has been identified that does not fit into the above efforts. The Reclamation Canal is owned and operated by the Monterey County Water Resources Agency. The reach of the Reclamation Canal between qqq and Gabilan Creek is a low water velocity environment where fine suspended sediment particles that pollutants adhere to settle out of suspension. This reach of the Reclamation Canal may be a concentrated source of legacy pesticides and priority*

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*organics, therefore, it is desirable to better describe the volume and level of contamination within its bottom sediments. This work will should be performed in order to answer the question of whether to dredge the reach and dispose of the dredge spoils or to leave the sediment in place.*

*The section of the Upper Salinas Reclamation Canal/Alisal Creek may be an ongoing in stream source for legacy pesticides/priority pollutants. The section begins adjacent to the southwest side of the airport near La Guardia road and continues for approximately 2.6 miles to its confluence with Gabilan Creek in Carr Lake. This section of the canal contains a fairly large amount of very fine bottom sediment. It is a low-gradient, trapezoidal channel that is receives agricultural return water from agricultural lands upstream (1200 acres of source area) as well as run-off from urbanized/industrial areas within the City of Salinas. During non-storm flows, the water velocity is very slow through this section of the canal. The slow velocity coupled along with the section's long length makes it a very effective sediment settling zone. The volume of sediment and the sediment quality should be characterized in order to establish whether this section represents a significant source of legacy pesticides/priority pollutants within the stream system. This section of the canal had high concentrations of several compounds in tissue samples taken during the 1980's and 1999.*

NTR: In the monitoring section there is a recommendation for characterizing a section of the Salinas Reclamation Canal to determine if it is worthwhile to dredge that section of channel. Should implementation include a reference to the possibility that dredging might be required? The implementing party would be the Monterey County Water Resources Agency (I have not spoken with them about the monitoring or the dredging).
NTR: **Blanco Drain – Pump and Flood gate**
Blanco drain appears to be a significant source of legacy pesticides/priority organic compounds. The drain contains a sump that is pumped out into another drain that passes through a flood gate and then into the Salinas River. The intake to the pump is a shallow well. Should this be considered a point source and handled that way? The implementing party would be the Monterey County Water Resources Agency.

Table 8-1 Implementation Actions of Responsible Parties for Legacy Pesticides/Priority Organics

| Responsible Party | Source Category | Management Measure | Action |
|---|---|---|---|
| Operators or owners of irrigated lands | 1A<br>Agricultural Lands | Erosion Control | Install and maintain erosion control structures/practices. |
| | | Sediment Management | Properly manage sediment removed from agricultural drains and ditches. |
| | | | |
| City of Salinas | 2A<br>Urban Lands | Erosion Control | Implement the requirements of the Storm Water Permit to prevent erosion from the various land uses within the City. |

## 8.2. Implementation Actions - Chlorpyrifos and Diazinon

Staff identified implementation actions that address the sources chlorpyrifos and diazinon. Chlorpyrifos and diazinon are used on irrigated agricultural lands and in the urban environment within the lower Salinas River Valley. Chlorpyrifos and diazinon move in the water as dissolved compounds and attached to soil particles suspended in the water. Implementation actions should address the reduction in the use of chlorpyrifos and diazinon, must keep chlorpyrifos and diazinon from entering the water and must address erosion/sedimentation of lands where chlorpyrifos and diazinon are applied.

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### *Agricultural Land Sources*

The Conditional Agricultural Waiver that was issued by the Central Coast Regional Water Quality Board in July 2004 is the implementing mechanism for the control of chlorpyrifos and diazinon from agricultural lands identified as potential source areas in this TMDL. The agricultural waiver requires enrollees to create farm management plans that address irrigation management, erosion control and pesticide management. By implementing their farm plans enrollees will address erosion/sedimentation associated with irrigated agricultural lands.

Owners and/or operators of irrigated agricultural lands are the implementing parties responsible for the controlling erosion/sedimentation from agricultural land sources.

### *City of Salinas Sources*

The City of Salinas's National Pollutant Discharge Elimination System (NPDES) Storm Water Permit is the implementation mechanism for the control of chlorpyrifos and diazinon from areas within the City of Salinas. The City's Storm Water Permit requires management of pollutants in run-off from construction sites, new development, industrial and commercial sites, municipal properties. The permit also requires the City to implement a Public Outreach and Education effort to raise awareness of impacts of urban run-off to waters of the state and to disseminate information on management practices that are effective at mitigating those impacts. This TMDL specifically requires the City to educate the public about the impact of chlorpyrifos and diazinon on water quality and about the disposal options for products that contain these chemicals. NTR: I need to run this by Donette to see if an amendment is required or if there is a better way to handle this.

The City of Salinas is the implementing party responsible for controlling erosion/sedimentation from urban source areas.

Table 8-2 Implementation Actions of Responsible Parties for Chlorpyrifos and Diazinon

| Responsible Party | Source Category | Management Measure | Action |
|---|---|---|---|
| Operators or owners of irrigated lands | 1A Agricultural Lands | Erosion Control | Install and maintain erosion control structures/practices. |
| | | Sediment Management | Properly manage sediment removed from agricultural drains and ditches. |
| | | Pesticide Use Reduction | Implement Integrated Pest Management, switch to pesticides with reduced environmental risk, reduction of chlorpyrifos and diazinon use. |
| | | Irrigation Management | Reduce off-site run-off from irrigation. |
| | | | |
| City of Salinas | 2A Urban Lands | Public Participation and Outreach | Educate the public regarding hazards of diazinon and chlorpyrifos use and inform the public of disposal options. |
| | | Erosion Control | Implement the requirements of the Storm Water Permit to prevent erosion from the various land uses within the City. |

## 8.3. Regulatory Mechanism and Reporting Requirement

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Implementation actions in this Plan, as well as monitoring requirements discussed below, are required through existing regulatory mechanisms, including:

1) The Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Order No. R3-2004-117).
2) National Pollutant Discharge Elimination System (NPDES) permit for Municipal Storm Water Discharges for the City of Salinas (NPDES NO. CA0049981).

*Conditional Agricultural Waiver.* Pursuant to the Conditional Waiver of WDRs for Discharges from Irrigated Lands, dischargers shall not cause or contribute to conditions of pollution or nuisance, or to exceedances of any Regional, State, or Federal water quality standard (conditions 1 and 3, p. 13 of Order No. R3-2004-117). Thus, compliance with the conditions of the waiver is expected to result in the reduction and/or elimination of sediment containing legacy pesticides/priority organics, chlorpyrifos and diazinon from irrigated agricultural lands. It is also expected to result in the reduction and/or elimination of chlorpyrifos and diazinon loading from irrigated agricultural lands. Additionally, the Regional Board Executive Office will amend the Monitoring and Reporting Program to incorporate the monitoring requirements specified below.

*City of Salinas NPDES Storm Water Permit.* This Implementation Plan requires the City to implement actions within their public education and outreach that inform the public of the impacts of chlorpyrifos and diazinon to water quality and to provide information regarding disposal options for products that contain these chemicals. Additionally, the Regional Board Executive Officer will amend the Monitoring and Reporting Program to incorporate the monitoring requirements specified below.

## 8.4. Other Implementation Efforts

NTR: Should I insert federal cancellation of use for chlorpyrifos and diazinon for completeness.
NTR: Should I include coordination with DHS for posting areas with shellfish designation and tissue samples exceeding NT.
NTR: add Rec Canal characterization as part of implementation.

## 8.5. Evaluation of Implementation Progress

Regional Board staff will conduct a review every five years beginning five years after approval of this TMDL by the Office of Administrative Law. Regional Board staff will utilize annual reports, as well as other available information, to review water quality data and implementation efforts of responsible parties and progress being made towards achieving the allocations and the numeric targets. Regional Board staff may conclude and articulate that ongoing implementation efforts may be insufficient to ultimately achieve the allocations and numeric targets. If staff were to make this determination, staff would recommend that additional reporting, monitoring, or implementation efforts be required either though approval by the Executive Office (e.g., pursuant to Section 13267 or Section 13383 of the California Water Code) or by the Regional Board (e.g., through revisions of an existing permit and/or Basin Plan Amendment). Regional Board staff may conclude and articulate that at the time of review, they expect implementation efforts to result in achieving the allocation and numeric target. In that case, existing and anticipated implementation efforts should continue. Five-year reviews will continue until the TMDL is achieved. The target date to achieve the TMDL is 40 years after implementation commences for legacy pesticides/priority organics and 10 years for chlorpyrifos and diazinon.

## 8.6. Timeline for Implementation

Regional Board staff anticipates that the allocations, and therefore the TMDL, will be achieved in 40 years for the legacy pesticides/priority pollutants and 10 years for chlorpyrifos and diazinon. The estimate for the legacy pesticides/priority pollutants is based on the anticipated rate of natural attenuation of the compounds of concern

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and the fact that the chemicals are distributed ubiquitously throughout the area included in this TMDL. The estimate for chlorpyrifos and diazinon is based on the time needed to develop and implement effective management practices and management measures and the fact that agriculture relies heavily on these two chemicals, as is evidenced by the recent dramatic increase in use in diazinon. Staff anticipates that the full in-stream positive effects on water quality would be realized gradually after full implementation of management measures and practices. The Regional Board could consider additional requirements if they were to determine that full implementation was not resulting in adequate water quality improvement.

## 8.7. Cost Estimate for Implementation

Since the implementation of the TMDL relies on an existing storm water permit and an existing agricultural waiver, costs required by this TMDL are those associated with requirements that are above and beyond the requirements of the permit and the waiver. Additional requirements include public outreach on chlorpyrifos and diazinon for the City of Salinas and additional monitoring for the City of Salinas's and the agricultural waiver's Monitoring and Reporting Programs.

### *City of Salinas*

### *Agricultural Waiver*

# 9. MONITORING

Monitoring of TMDL numeric targets will be accomplished through three existing monitoring efforts with additional monitoring to fill gaps left by these efforts. The three efforts include: the Agricultural Waiver Monitoring Program, the City of Salinas's Storm Water Monitoring Program and the Central Coast Ambient Monitoring Program's (CCAMP) annual coastal confluences and five-year regional rotation monitoring.

The agricultural waiver monitoring program will begin monitoring of certain lower Salinas Valley waterbodies in 2005. Toxicity monitoring along with sediment chemistry qqq be the initial screening tool with follow-up monitoring if a sample is toxic.

The new monitoring requirements of the City of Salinas's Storm Water permit are scheduled to be in place in early 2005. The monitoring program will monitor waters that pass through the City. Toxicity monitoring along with sediment chemistry will be employed with follow-up monitoring if a sample is toxic

The Central Coast Ambient Monitoring Program consists of a 5-year rotation through the region and an annual coastal confluences effort. CCAMP conducts synoptic, tributary based sampling each year monitor the Salinas River/Elkhorn Slough watersheds once every 5 years. The coastal confluence effort is an annual effort that monitors freshwater streams where they enter brackish or saltwater. Monitoring efforts that can support this TMDL include:

- Rapid Bioassessment using benthic invertebrates
- Chemical analysis of tissue, water, and sediment
- Toxicity evaluations

CCAMP will continue to support annual bioaccumulation monitoring, using planted mussels, at Moss Landing Harbor. This site has a long-term record for mussel tissue data and represents the flux of all that flows from the source areas within the Salinas Reclamation Canal, Tembladero Slough, the Old Salinas River Estuary, Espinosa Slough and Alisal Slough watersheds.

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The above monitoring programs do not include any sites in the Salinas River Lagoon, North or in Elkhorn Slough. These waterbodies receive inputs from upstream watersheds and require less frequent monitoring in order to supplement the other monitoring programs.

<u>Costs while samples exceed numeric targets</u>
13 sites x 4 samples/site/year x qqq $/sample = $/year Chlorpyrifos and diazinon water column
18 sites x 1 sample/site/3 years x qqq $/sample =$/year Legacy pesticide sediment analysis
3 sites x 1 sample/site/3 years x qqq $/sample =$/year Legacy pesticide tissue monitoring

<u>Costs while samples are less then or equal to numeric targets</u>
13 sites x 4 samples/site/year x qqq $/sample = $/year Chlorpyrifos and diazinon water column
18 sites x 1 sample/site/1 year x qqq $/sample =$/year Legacy pesticide sediment analysis
18 sites x 4 sample/site/1 year x qqq $/sample =$/year Legacy pesticide water column
3 sites x 1 sample/site/1 year x qqq $/sample =$/year Tissue Monitoring

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Table 9-1 Pesticide Monitoring

| | Waterbody | Fresh/ Brackish/ Salt Water | Site | Monitoring Effort | Water Column | Sediment | Tissue | Water Column Toxicity Testing | Sediment Toxicity Testing | Benthic Invertebrat Assessment | TMDL Use |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Gabilan Creek | Fresh | 309GAB | Ag Waiver | 1, *A1* | *A2* | | 2 | 3 | 4 | Source |
| 2 | Salinas Reclamation Canal, Upper/Alisal Creek | Fresh | 309ALU | Ag Waiver, CCAMP | 1, *A1* | *A2* | | 2 | 3 | 4 | Compliance |
| 3 | Salinas Reclamation Canal, Lower | Fresh | 309SRC | City of Salinas Storm Water | *5, A1* | *A2* | | | | | Compliance |
| 4 | Salinas River | Fresh | 309SAS | Ag Waiver | 1, *A1* | *A2* | | 2 | 3 | 4 | Compliance |
| 5 | Salinas River | Fresh | 309SDR | City of Salinas Storm Water | 5 | | | | | | Compliance |
| 6 | Salinas River Lagoon, North | Brackish | 309SBR | CCAMP | | *A2* | *A3* | | | | Compliance |
| 7 | Blanco Drain | Fresh | 309BLA | Ag Waiver | 1, *A1* | *A2* | | 2 | 3 | 4 | Compliance |
| 8 | Alisal Slough | Fresh | 309ALS | Ag Waiver | 1, *A1* | *A2* | | 2 | 3 | 4 | Source |
| 9 | Salinas Reclamation Canal, Lower | Fresh | 309JON | Ag Waiver | 1, *A1* | *A2* | | 2 | 3 | 4 | Compliance |
| 10 | Espinosa Slough | Fresh | 309ESP | Ag Waiver | 1, *A1* | *A2* | | 2 | 3 | 4 | Compliance |
| 11 | Tembladero Slough | Fresh | 309MER | Ag Waiver, CCAMP | 1, *A1* | *A2* | | 2 | 3 | 4 | Compliance |
| 12 | Tembladero Slough | Brackish | 309TDW | Ag Waiver, CCAMP | 1 | *A2* | | 2 | 3 | 4 | Compliance |
| 13 | Old Salinas River Estuary | Brackish | 309OLD | Ag Waiver, CCAMP | 1, *A1* | *A2* | | 2 | 3 | 4 | Compliance |
| 14 | Moro Cojo Slough | Brackish | 309MOS | Ag Waiver, CCAMP | 1 | *A2* | | 2 | 3 | 4 | Compliance |
| 15 | Moss Landing Harbor, South | Salt | 306-404 | CCAMP | | *A2* | 6 | | | | Compliance |
| 16 | Moss Landing Harbor, North (Yacht Basin)/Bennett Slough | Salt | 306BEN | TMDL | | *A2* | *A3* | | | | Compliance |
| 17 | Elkhorn Slough | Salt | 306-402.2 | SMW, TMDL | | *A2* | *A3* | | | | Compliance |
| 18 | Elkhorn Slough | Salt | 306ELK | CCAMP | | *A2* | | | | | Compliance |
| 19 | Quail Creek | Fresh | 309QUA | Ag Waiver, CCAMP | 1, *A1* | | | 2 | 3 | 4 | Compliance |
| 20 | Chualar Creek | Fresh | 309CHU | Ag Waiver, CCAMP | 1, *A1* | | | 2 | 3 | 4 | Compliance |
| 21 | Salinas River | Fresh | 309SAC | Ag Waiver, CCAMP | 1, *A1* | *A2* | | 2 | 3 | 4 | Source/ Background |

1 – Ag Waiver Requirement: Monthly conventional water quality, flow
2 – Ag Waiver Requirement: Freshwater Column Toxicity Testing, 4 time/year: 2 during the wet season (Oct 15 – March 15), 2 during the dry season (May 15 – Oct 15)
3 – Ag Waiver Requirement: Freshwater Sediment Toxicity Testing, 1 time/year: Spring (March 1 – April 30)
4 – Ag Waiver Requirement: Benthic Invertebrate Assessment, 1 time/year: Spring (March 1 – April 30) Concurrent with Sediment Toxicity Testing
5 – City of Salinas Storm Water Monitoring
6 – CCAMP Monitoring – transplanted Mussels
*A1* - Add quarterly Diazinon & Chlorpyrifos 1st year after approval of TMDL
*A2* – Add Sediment Chemistry – once every 5 years beginning in 1st CCAMP rotation after approval of TMDL. Qqq It would be nice to do this more frequently, but it may not be practical.
*A3* – Add tissue monitoring of transplanted shellfish - once every 5 years beginning in 1st CCAMP rotation after approval of TMDL.

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## 9.1. Data Assessment

Legacy pesticides
For Water Column, start quarterly every year once sediment and tissue are below NT for all constituents.
For sediment, every 5 years until below NT for all constituents, then yearly until three clean years.
For tissue, every 5 years until below NT for all constituents, then yearly until three clean years.

Because tissue samples are affected by the amount of suspended sediment in the water, staff has set a minimum flow requirement based on the USGS flow gage at Spreckels. In order for clean tissue samples to be accepted, the average of the daily mean flow ($ft^3/s$) shall be 25 $ft^3/s$ at the USGS gage at Spreckels, California (gage no. 11152500) over the period that the shellfish are deployed at the monitoring station. Use of provisional data is acceptable. USGS Surface Water Data Website: http://waterdata.usgs.gov/ca/nwis/sw

**Table 9-2 Approach to Assessment of Monitoring Data for Salinas River Valley/ Elkhorn Slough Area Waterbodies**

| Water Quality Category | Sediment Quality Category | Tissue Results Category |
|---|---|---|
| No more than 1 sample [A] exceeds numeric target values within last 3 years (Minimum 10 samples) OR Water TIEs do not identify pollutant of interest as toxicant (minimum 3 samples over 3 years ) | <25% samples [B] exceed numeric target value (Minimum 10 samples) OR Sediment triad or TIE studies do not identify pollutant of interest as toxicant (minimum 3 samples over 3 years) | <25% samples [B] above numeric target value (Minimum 10 samples over 5 years) OR No posted consumption advisory within last 10 years for pollutant of interest (Minimum of 10 samples over 5 years) |
| AND No sample > 20x numeric target value | AND No sample > 20x numeric target value | AND No sample > 20x numeric target value |

[A] >10% and "two or more" from EPA 305(b) guidance (1997), Volume 2, section 3.2.4 on toxics in water samples. http://www.epa.gov/owow/monitoring/305bguide/v2ch3.pdf
[B] 25% from Consolidated Assessment and Listing Methodology guidance (EPA July 2002). http://www.epa.gov/owow/monitoring/calm/calm_ch4.pdf

# 10. References


BPTCP, 1998. *Chemical and Biological Measures of Sediment Quality in the Central Coast Region – Final Report.* California State Water Resources Control Board, Division of Water Quality, Bay Protection and Toxic Cleanup Program.

Buchman, M.F., 1999. *NOAA Screening Quick Reference Tables, NOAA HAZMAT Report 99-1*, Seattle WA, Coastal Protection and Restoration Division, National Oceanic and Atmospheric Administration, 12 pages.

CCRWQCB, 2002, *Summary of Sediment Contamination Data from Moss Landing Harbor, Monterey County*. In Item 18-Executive Officer's Report to the Board. Central Coast Regional Water Quality Control Board, July 12, 2002 Board Meeting. http://www.swrcb.ca.gov/rwqcb3/Board/Agendas/071202/ItemReports/Item18/StaffReport18.pdf

CCRWQCB, 1994. *Water Quality Control Plan for the Central Coastal Basin (Basin Plan)*. Central Coast Regional Water Quality Control Board. September, 1994.

CVRWQCB, 2004. San Joaquin River Pesticide TMDL(qqqNot sure of document, only have part of peer review draft). Central Valley Regional Water Quality Control Board.

CDFG, 2004. Finlayson, Brian. *Memorandum from Brian Finlayson of California Department of Fish & Game to Joe Karkoski of the Central Valley Regional Water Quality Control Board concerning "Water Quality for Diazinon*." July 30, 2004.

CDFG, 2000. Siepmann, S and B. Finlayson. Water Quality Criteria for Diazinon and Chlorpyrifos. California Department of Fish and Game Administrative Report 00-3.

QqqDelete??CDFG, 1994b. *Hazard Assessment of the Insecticide Diazinon to Aquatic Organisms in the Sacramento-San Joaquin River System.* California Department of Fish and Game, Environmental Services Division, Administrative Report 94-2.

CDPR, Downloaded November, 2004. *Surface Water Database.* California Department of Pesticide Regulation. http://www.cdpr.ca.gov/docs/sw/surfdata.htm

CDPR 1985. *Agricultural Sources of DDT Residues in California's Environment.* California Department of Pesticide Regulation. September 1985. http://www.cdpr.ca.gov/docs/ipminov/ddt/sources.htm

EPA 2002. Decision Document of Water Quality Assessment for San Diego Creek and Newport Bay. EPA, June 14, 2002.

EPA 2000. *Water Quality Standards; Establishment of Numeric Criteria for the State of California; Rule.* Federal Register, May 18, 2000. Part III, Environmental Protection Agency, 40 CFR Part 131.

EPA 1998. *EPA's Contaminated Sediment Management Strategy – EPA-823-R-98-001.* Environmental Protection Agency. April 1998. http://www.epa.gov/waterscience/cs/strategy.pdf

Hunt, John W., et al. May 2002. *Ambient Toxicity due to Chlorpyrifos and Diazinon in a Central California Coastal Watershed*. Environmental Monitoring and Assesment

Elkhorn Slough Foundation, Website-1 (visited 09/24/2004)
http://www.elkhornslough.org/caspiantern/caspiantern.htm

Elkhorn Slough Foundation, Website-2 (visited 09/24/2004)
http://www.elkhornslough.org/press/cojo.htm

MRLC, 1992. *National Land Cover Data*. Multi-Resolution Land Characteristic Consortium
http://www.epa.gov/mrlc/nlcd.html

New York State, 1999. *Technical Guidance for Screening Contaminated Sediments.* Department of Environmental Conservation, Division of Fish, Wildlife and Marine Resources. p. 24. Last update dated January 25, 1999.

SCS, 1978. *Soil Survey of Monterey County, California*. United States Department of Agriculture. Soil Conservation Service. May, 1978

Draft

Scholz, Nathaniel L., N.K. Truelove, B.L. French, B.A. Berejikian, T.P. Quinn, E. Casillas, T.K. Collier, 2000. *Diazinon disrupts antipredator and homing behaviors in Chinook salmon (Oncorhynchus tshawytscha).* Canadian Journal of Fisheries and Aquatic Sciences. 57:1911-1918.

SWRCB, 2000. State Water Resources Control Board. Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Phase 1, of the Inland Surface Waters Plan and the Enclosed Bays and Estuaries Plan). California Environmental Protection Agency, Sacramento, California.

USGS, Website (Visited 09/28/2004). *United States Geological Survey, Surface-Water Data for California*. http://nwis.waterdata.usgs.gov/ca/nwis/sw

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# Appendix 1. LOWER SALINAS VALLEY/ELKHORN SLOUGH AREA LEGACY PESTICIDE/PRIORITY ORGANICS DECISION DOCUMENT